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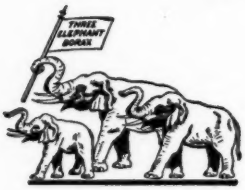

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXVIII NO. 3

TABLE OF CONTENTS, MARCH, 1944

Co-op Warp and Woof 3
Jeff Ties Up the Past and the Future

Doubling Production by Bettering Soils 6
Can Be Done, Says C. J. Chapman

The Response of Various Crops to Potash Fertilization in South Carolina 11
As Explained by W. H. Garman

That Land Boom 21
Should Be Controlled, Says C. B. Sherman

Soil Tests Indicate Potash Levels 23
As Seen by J. Fielding Reed

South Finds Clovers Excel in Profits 24
Discussed and Illustrated by F. J. Hurst

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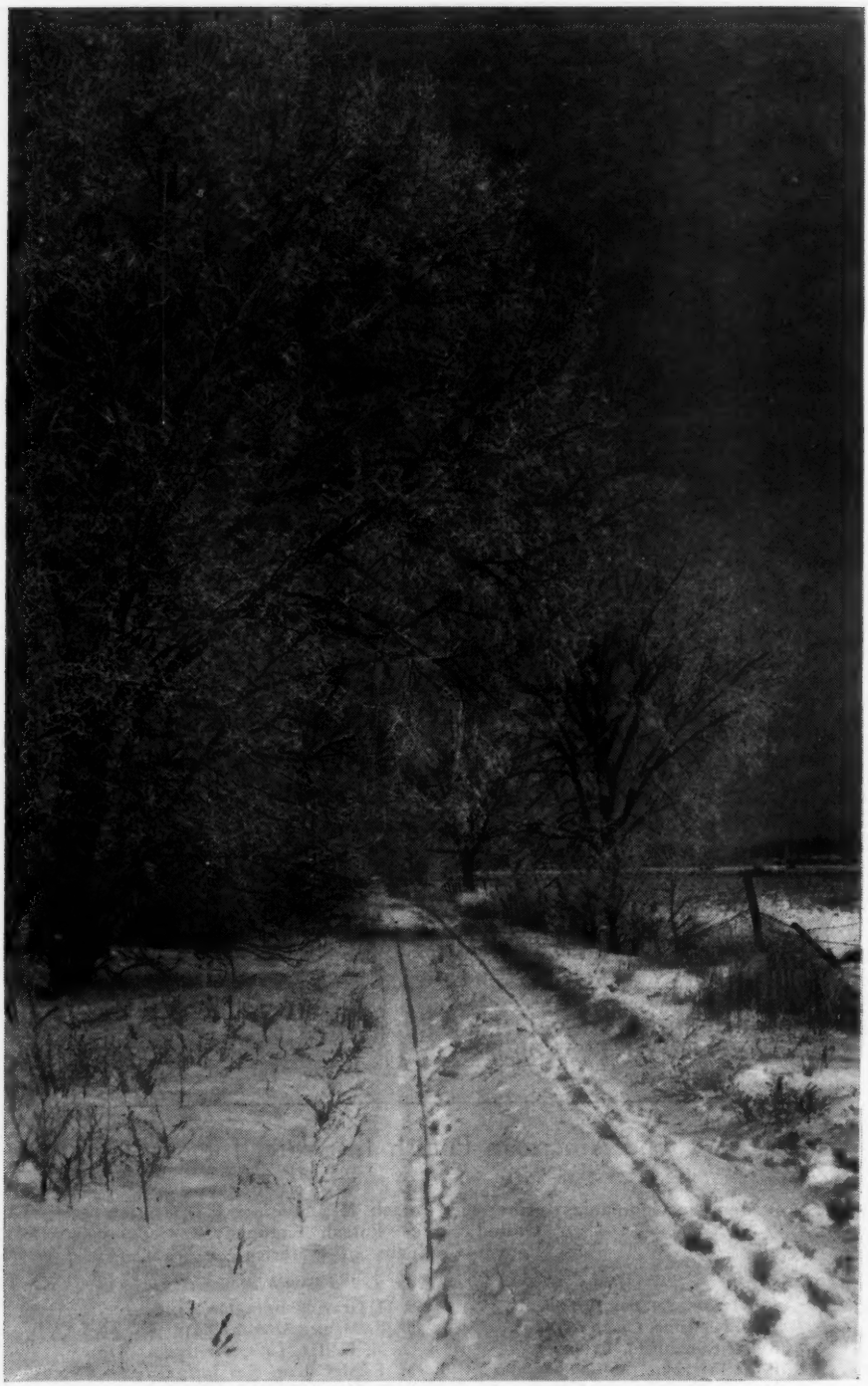

MARCH STORMS ARE APT TO BEGIN OR END IN ICE.

Better Crops with PLANT FOOD

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VOL. XXVIII WASHINGTON, D. C., MARCH, 1944 No. 3

A "Way of Life" Based on the—

Co-op Warp and Woof

Jeff McDermid

FARM leaders up in my neck of the wilderness claim that 1944 rounds out the first century of organized cooperative associations, a movement which nobody disputes is the strongest of all factors for agricultural solidarity. You may think that the present state of the universe hardly fits into a cooperative picture, even after one hundred years of boosting for it, but maybe by another century we'll all feel more chummy than we do now.

This anniversary gives me a hunch to peek and ponder a bit into the genesis of cooperation which they celebrate, and set down a few observations of my own about it; albeit my name does not belong on any cooperative roster and I have never displayed any skill at launching cooperative programs. My place has been at the reportorial table, jotting down the wise-saws and modern instances uncorked by effervescent co-op champions.

Humanity loves anniversaries. Milestones are rallying points for further propaganda. Birthdays are convenient dates on which to measure growth and receive plaudits and presents. Encouragement in spells of stress and turmoil comes from these backward glances to feeble beginnings. Mighty forces with proud leadership also acquire a needful dose of humility sometimes by reviewing the poverty and injustice that sired their venture.

Thus it happens that co-op enthusiasts are digging into musty records and dim references to retell the story of the Society of Equitable Pioneers,

formed in 1844 by Rochdale flannel weavers, led by the labor lobbyist, Charles Howarth. He banded together twenty-eight poor factory slaves of the English loom and held them in accord until nearly a year later, when they had saved one hundred and fifty dollars to open a mean little provision house on Toad Lane, the rent for which cost them one third of their hard-earned hoard.

Using the services of one Sam Ashforth as unpaid storekeeper evenings until they could overcome the competition of snugly housed rivals and maintain the loyalty of timid and complaining wives and mothers, these rugged Socialists, Chartists, Owenites, and Teetotalers wove something hard and fast into their looms without realizing its importance as a fabric for future welfare.

SAM ASHFORTH probably deserves a biography all by himself, as later on he rose to prominent place in the wholesale side of cooperative merchandising. Be that as it may, we simply have his diary to remind us that the stock of goods they displayed to customers in December 1844 consisted only of 22 pounds of butter, 50 pounds of sugar, six sacks of flour, one sack of oatmeal, and two dozen candles!

How this gawky young weaver, Sam Ashforth, has since found counterparts throughout the length and breadth of our agrarian zones, in the person of co-op produce managers, store bosses, warehousemen, and feed and fertilizer dispensers, constitutes a very long yarn, a much longer yarn indeed than those weavers ever expected to see spun out.

Anyhow, their original charter of membership shows only nine of the twenty-eight founders to be other than weavers. Jim Smithies was a bookkeeper, David Brooks a block printer, John Collier an engineer, George Healey a hatter, John Kershaw a warehouseman, John Screwcroft a hawker, James Wilkinson a shoemaker, John Garside a carpenter, and John Bent a tailor. One woman, Ann Tweedale, has her name on the books, listed only as a Socialist. That one feminine touch completes the saga, so that our dear sisters can join us in toasting the enterprise, liquidating it with whatever refreshing beverage seems most suitable to the Scotch, Welch-English heritage. Up she goes, with mud in the eye to all co-op enemies! Prosit, Skoll, and Here's How! (For the sake of the minority above, who were said to be Teetotalers, use a dash of aqua pura.)

Howarth, the chief schemer, was a warper in the big woolen mills, that is, when he was not figuring as an agitator for the ten-hour working day and the right to strike. Maybe that little slant on their John the Baptist may not sit so well with a section of the present cooperative clan, to whom a pinkish tinged labor leader smells pretty strong.

And as a matter of good truth, those who don't like "radicals" had better not poke too deeply into the germination time of English cooperation, for it reeks with radicals and swirls with malcontents. Probably there would be no chance to start any corrective movement like that without the dare-devil doggedness of such nonconformists.

But what we are concerned with in celebrating the Rochdale anniversary is the warp and woof they fixed. Others coming afterwards made the patterns and cast the threads of decorative and desirable design, as we see it in detail now. Now just what was the warp and woof, the skeleton groundwork of this rich tapestry that ornaments the modern altar of cooperation?

TO see it clearly, understand that the Rochdale boys were able to fix such a tough and ingenious warp and woof for future shuttles because of a few blunders which others had made before them.

For the Rochdale clan was not the first to want companionship in misery as a means of getting ahead. During the years preceding the experiment in Toad Lane merchandising, there were scores of so-called Friendly Societies, Penny Capitalists, and followers of William King and Robert Owen in a sort

of paternalistic self-help crusade. Maybe Owen himself carried the germ of true cooperation in his attempt to socialize and uplift the working classes whom he employed, but his story does not seem to get farm leaders excited, so let's drop him.

What the Rochdale gentry did in fixing the warp and woof of the cooperative web was to insert a couple of points in their by-laws which had never appeared in the traditions of guilds and

thrift clubs and penny-pinching workmen seeking relief from grinding penury.

You don't find the fibers of their real warp and woof in the declaration of aims, such as merchandising, housing improvement, and some limited manufacturing of consumer goods. It wasn't what they intended to do in a productive way that makes history. It was how they intended to govern their society and hold it together as a trading concern that would last.

I refer to Point No. 3 and Point No. 6 in this Magna Charta of Cooperation. Here you see the warp and woof which have undergone much strain without breaking a thread or unraveling much in a whole century of progress. Any ruralite will agree that Rochdale unknowingly said a mouthful when they (or Mr. Agitator Howarth) wrote these points down by candle glow.

So all ye who revel in patronage dividends and want to reward customers and attract trade in the cooperative way, take due note of No. 3 in Rochdale's warp:

"*The distribution of profits (after meeting expenses and interest charges) shall be in proportion to purchases.*"

Howarth and his weavers were as ignorant of making an important, world-shaking discovery as Columbus was when he landed on San Salvador, but this simple sentence did it in a nutshell. It also put the kibosh on all wordy lawyer lingo so often used to usher in some modern public policy.

Point No. 6 in the constitution was not quite so revolutionary as No. 3, but it has its modest virtues that induce me to call it the woof of the Rochdale web:

"*Each member of the society shall have one vote and no more.*"

This survives as one of the cornerstones of cooperation, keeping it in the democratic channel free from monopoly by financial power in the hands of greedy minorities. It distinguishes stock companies from cooperatives in one sense, and has been one reason for the popularity of the movement among farmers.

BEAR in mind that I do not say that either or both of these wise and significant contributions by Rochdale pioneers has meant that all subsequent schemes and programs hatched out in the name of cooperation and bearing the above hallmarks of validity have been worthy of success and confidence.

Cooperation has had its counterfeits and mountebanks slogging along in its wake like harpies and sharks ever since Howarth's lads opened shop in Toad Lane, Lancashire. And almost worse than that, it has had hosts of failures to be blamed on indifference and neglect. Other blows at the heart of these enterprises have been struck by over-optimistic fellows with ideas that you could buy and sell things at cost and get rich quick individually and collectively at one and the same time.

Few avenues of human endeavor and ambition are left untouched by some

(*Turn to page* 50)

"Milk Flows Where Alfalfa Grows"

The lime requirement of this crop is high. Acid soils should be limed and well fertilized for abundant production.

Doubling Production By Bettering Soils

By C. J. Chapman

Soils Department, College of Agriculture, Madison, Wisconsin

MOST of us agree that there is still a great opportunity for increasing the productiveness of land now under cultivation. It has been said that the average Wisconsin dairy farmer is operating on about a 50 per cent efficiency basis. Total production of crops, as well as the livestock-carrying capacity and output of dairy products, could be increased a good 50 per cent—in fact it would be possible to double the gross returns on many farms if all of those practices of good soil, crop, and livestock management were carried out over a period of years.

If we were to take an average cross section of all the 190,000 farms in Wisconsin and compare the output of this average with production on those few farms which we consider to be models of efficiency, I think the above statements would prove to be correct. And here is the program, which, if followed out over a period of years, might make possible the doubling of the gross output and income of the average farm, and at the same time show a good profit on the practices suggested:

1. The conservation of the soil by erosion control and humus-maintenance practices.

2. The liming of every acre of acid soil on the farm, and the maintenance

of adequate lime supplies by subsequent reliming every few years.

3. The return to the soil of the plant-food nutrients contained in animal manures.

4. The regular and systematic use of commercial fertilizers on all fields and crops wherever profit can be derived from its application.

5. The providing of good pasture throughout the spring, summer, and fall months. This pasture-improvement program should include the fertilization (and renovation where practical) of both permanent and rotational pasture, and the providing of emergency pasture for mid- and late-summer grazing.

6. The growing of those crops, especially alfalfa and clover, which will produce the largest returns in crop-feed units from our cultivated fields.

A program in which all six of the above factors are put into action and carried out over a period of years will go a long way toward accomplishing the goal of 100 per cent efficient production. But I haven't mentioned the other factor, and perhaps the most important, in this program of dairy farm efficiency, and this is my trump card:

7. Feed the good crops grown on our farms to good cows.

Good Cows! And in these words I wish to convey all those principles of dairy-herd improvement and management which for a period of 50 years our colleges have so consistently preached and taught. But there is still room for improvement, even in the matter of good cows and efficient feeding practices.

The feeding of crops grown to livestock and the return of the manure produced to our soils have not maintained the productiveness of Wisconsin farm land. In fact, a careful study of the situation reveals that for years we have been "selling our farms down the river," and I am not so sure but that we have been "losing ground" faster in a livestock-dairy-farming system than is true right now in those states where most of the crops grown are sold for cash. Certainly it is true we have been burning up the humus and organic matter of our soils at a rapid rate. We have plowed and plowed to grow crop after crop of corn and grain. Our hillsides have lost both humus and the soil itself.

Manure allowed to leach away and decompose in piles back of the barn during the summer loses much of value. Better to haul and spread every day during the winter.

Many of these sloping fields have been left in a naked and half-starved condition.

Mr. Faulkner in "Plowman's Folly" must be given credit for calling our attention to the evils of over-plowing and more especially to a system of farming that has resulted in the exhaustion of the organic matter in our soils.

The statement has been made that the plant-food losses incurred in the handling of manure, produced on Wisconsin farms last year cost our farmers $100,000,000 in possible crop production. If it is true that the total value of all of the manure produced on Wisconsin farms is $100,000,000, one-third of which is lost by careless and wasteful methods of handling, and if we assume further that a dollar's worth of manure is capable of producing three dollars in crop increases, then it is true that the potential crop losses in Wisconsin last year as mentioned above did amount to the staggering total of $100,000,000.

Value of Saving Manure

We are urging farmers as never before to take better care of the manure produced on their farms. Manure now has a high value. We urge our farmers to use plenty of bedding and save the liquid manure. We point out that nearly one-half of the nitrogen and from 65 to 80 per cent of the potash are contained in the urine. We further urge farmers to haul their manure every day and spread it on their fields even during the winter months when snow covers these fields. Losses will be less where the manure is hauled and spread than where it is allowed to ferment and leach away in piles back of the barn. When fermented manure is spread in the spring or summer, we lose much of the nitrogen by evaporation in the form of ammonia.

The very fact that losses of plant food in a livestock system of farming are high and that these losses have been going on for many years is the reason why our soils are runniing so low on the reserves of available phosphorus and potash and why our crops are responding so generously to fertilizer treatment.

I have said that the dairy farmer may be losing fertility faster than the corn-grain farmer. I am sure this is true with respect to potash losses. In our modern grain, corn-clover system of farming most farmers leave straw and stalks on the ground where they are plowed under. A very high percentage of the potash is contained in the straw and fodder of these crops. Even where soybeans are grown in rotation with corn and grain and are combined in the field, the straw is left on the ground and thus most of the potash is returned to the soil. But in a livestock system of farming, most of the crops are fed and the potash is voided largely in the liquid manure. Furthermore, a high percentage of the potash contained in the straw and fodder used for bedding is in water-soluble form and subject to loss by leaching. On the average dairy farm, not more than 45 to 50 per cent of the potash contained in crops grown actually finds its way back to the cultivated fields in the manure. In fact, not more than 50 per cent of the nitrogen and phosphorus contained in these feeds gets back to our cultivated fields. We are short-changing our farms every year, even in a livestock system of farming, and this has been going on year after year for a good 50 years.

Is it any wonder then that commercial fertilizers are being used so extensively and crops responding so tremendously to their use? We have fought a battle in Wisconsin for the past 25 years in our efforts to break down the prejudice against the use of commercial fertilizers. We have battled against the forces of indifference and that feeling of self-security which our livestock farmers have grown up with. The growing of legumes and the maintenance of a fairly good level of nitrogen on some of our farms seemed to mislead us. The lodging of grain was thought to be a sign of high fertility, but gradually it has become clear that on many of these farms where lodging

Barley on the farm of Danielson Bros., Chippewa county, Wis., responded in a striking way to treatment with fertilizer. Yields were: No treatment, 22.9 bu. per acre; 0-20-0 at 200 lbs. per acre, 39.4 bu. per acre; 0-20-10 at 200 lbs. per acre, 40.2 bu. per acre.

was a problem there had developed an unbalanced condition of plant-food nutrients in the soil. Farmers now admit there must be a deficiency of certain plant-food elements.

Field demonstrations on our Wisconsin farms with phosphate and potash fertilizers, applied to the grain and legume seedings, have proven that yields, even on fields where lodging was a problem, could be increased. The grain may still lodge on many of these fertilized plots, although we have observed that where soil tests show a need for potash and potash was used, lodging was less severe. Catches of clover or alfalfa were usually better on those plots receiving the potash in addition to the phosphate.

I never tell a farmer that the use of potash in the fertilizer will prevent lodging, but I do make the statement that when potash is needed and used in the proper proportions, there will be less tendency to lodging. I have seen plots even where potash fertilizers were used "go down" worse than the unfertilized plots. The rankness and heaviness of growth in these cases overbalanced the advantage gained in the thicker cell walls in the plant tissues and the resulting stiffness of the straw.

However, there are thousands and thousands of acres of land in Wisconsin where lodging is not a problem. Our light-colored silt and clay loams, as well as sandy soils, are frequently so low in nitrogen that they do not produce enough straw. For our grain and legume seedings on such soils, we are finding it profitable to use fertilizers containing some nitrogen. In fact, the use of nitrogen in fertilizers for grain on the thinner, poorer soils will be more strongly advocated now that the cost of nitrogen is less and supplies are becoming more and more abundant. We especially recommend the use of some nitrogen in the fertilizer for our new rust and smut-resistant Vicland oats, when grown on these thinner sandy soils. This variety of oats is short-strawed and our agronomists have hesitated in recommending it on these lighter soils for this reason.

The prejudice against the use of fertilizer in Wisconsin is dying out. The tonnage of fertilizer used is increasing by leaps and bounds. In 1943 Wisconsin farmers bought and used about

175,000 tons of commercial fertilizers. Just four years previous (1939), 42,623 tons were sold.

Our state-wide program of soil testing has been an important factor in "selling" Wisconsin farmers. Records show that in the five-year period, December 1, 1938, to December 1, 1943, a total of 270,179 samples of soil were tested in our State, district, and county laboratories. The average of all the tests shows that 76 per cent of our soils are deficient in available phosphorus and 53 per cent are low in available potassium; 65 per cent of these samples are acid and the fields from which they were taken are in need of lime.

This soil-testing program has been helpful in stimulating interest in the use of fertilizers. It has given farmers a more intelligent basis on which to order the kinds of fertilizers best suited to soils and crops. I will never argue, however, that the soil test is a 100 per cent accurate means of determining the kind of fertilizer to use. But the results of our soil tests have been very helpful in the hands of our county agents, teachers of vocational agriculture, and fertilizer salesmen, as a basis for recommending fertilizers. Certainly, recommendations made on the basis of soil tests are more accurate than simply "guesses."

The thousands of demonstrations carried out all over the State have been of even greater value in "selling fertilizers" to Wisconsin farmers. Not only have these demonstrations given individual farmers a "see and believe" lesson, but these field trials carried out by county agents and teachers of vocational agriculture have likewise given "the teacher" himself first-hand information. In turn, these educational leaders have gone out in their counties and communities with enthusiasm and conviction and have talked fertilizers. The results of these field demonstrations have given all of us more confidence in our soil tests and recommendations based on soil tests. Furthermore, the yield data and pictures secured from field demonstrations have been of great help in carrying out an educational program through the media of radio, press, and platform. Each year the results of

(*Turn to page* 48)

This picture shows the first good crop of clover hay in many years on this field. Leonard Winiecke, a "Whole Farm" T.V.A. cooperator, was well pleased with the results. Harry Noble, Portage county, Wis., agent, holds a bundle of the kind of hay this field had been growing for many years. Yields were: No treatment, 1,186 lbs. per acre; 300 lbs. of 0-20-0 per acre, 4,060 lbs. per acre; 300 lbs. of 0-20-20 per acre, 5,493 lbs. per acre.

The Response of Various Crops to Potash Fertilization in South Carolina

By W. H. Garman

South Carolina Agricultural Experiment Station, Clemson, South Carolina

LIEBIG was probably the first to emphasize the possibility of depleting soils by cropping if the bases removed were not replaced by manure or artificial fertilizer. He recognized that one of the great benefits from fallowing was due to the weathering of "insoluble" minerals to release bases.[1]

With reference to potash he stated: "The potash contained in the soil itself is inexhaustible in comparison with the quantity removed by plants. But when we increase the crop of grass in a meadow by means of gypsum, we remove a greater quantity of potash with the hay than can under the same circumstances be restored. Hence it happens that, after the lapse of several years, the crops of grass on the meadows manured with gypsum diminish, owing to the deficiency of potash. But if the meadow be strewed from time to time with wood ashes, even with the lixiviated ashes which have been used by soap boilers, then the grass thrives luxuriantly as before. The ashes are only a means of restoring the potash."

It was an acquaintance of Liebig who gave the first detailed account of the use of potash in this country. J. Lawrence Smith,[1] while assayer for the State of South Carolina, was given permission by the cotton planters of his State to determine the cause of cotton rust. His findings were printed in 1847 in pamphlet form, under the title of "Report to the Black Oak Agricultural Society on the Ashes of the Cotton Stalk, the Composition of Cotton Soils, and the Nature of Rust in Cotton."

In appraising the fertility level of many soils he used an extractant described as "warm muriatic" acid, and did not employ the usual method of determining total soil bases as was the practice of early workers. He checked his findings by field observations. This work was an approach to our present-day methods of soil diagnosis.

He described cotton rust as a nutritional disturbance. The ash of normal cotton plants was found to contain 24 per cent K_2O, and that of rusted plants only 15 per cent K_2O. Thus he was on the verge of discovering the cause of cotton rust as potash deficiency; however, finding more iron in the abnormal than in the normal plant, he was inclined to believe iron was the likely cause. He was thus dealing with the problem of soil acidity, and recommended top-dressing with leached wood ashes, thereby approximating present recommendations of top-dressing with potash for the correction of cotton rust and the application of lime for the correction of soil acidity.

During the ten decades which have passed since these findings were revealed, the soils of this State have been subjected to a system of almost continuous growing of clean-tilled crops. Cotton, corn, and tobacco have been the leading ones. Though erosion was noticed in the early days, little or no attention was paid to it. For many years

[1] Turrentine, J. W. Liebig and the Potash Industry. The American Fertilizer, March 15, 1941.

crops were removed and no fertilizer applied. It is not surprising, therefore, that the supply of available nutrients in many soils of the State is today quite limiting for the optimum production of nearly all crops.

Dr. H. P. Cooper, Director of the South Carolina Agricultural Experiment Station, was one of the first workers in the South to fully realize the importance of potash. As a result, considerable work was initiated in 1931 to investigate the role of potash in the nutrition of various crops. In the Forty-Seventh Annual Report of the South Carolina Experiment Station (1934) Dr. Cooper wrote: "Since corn and legume hay crops are usually not fertilized with a complete mixed fertilizer containing potash, the soils have become very low in available potash. It is a common opinion that corn and grain crops do not respond to potash fertilizers. This impression very probably results from some experimental data secured from rotation and fertilizer experiments where corn and legume hay crops are included in a rotation in which cotton is liberally fertilized with potash fertilizer. Where sufficient potash fertilizer is used for optimum results with cotton, there is sufficient available potash left in the soil for several corn and hay crops.

"Much of the potentially good corn land in the eastern part of the State has become so deficient in potash that corn is often almost a complete failure because of potash deficiency, which is often accompanied by corn root rots.

"The common field crops are affected by potash deficiency in the following order: Cotton, soybeans, cowpeas, corn, and oats. Cotton yields are the first to be seriously reduced by potash deficiency. Cotton is followed by soybeans and cowpeas. Oats are much more resistant than corn. One of the first symptoms observed in the oat crop is weak straw and serious lodging, or plants falling down before maturity.

"It is generally recognized that a heavy application of lime material may reduce the availability of the potash in the soil. This effect is often observed in the cotton crop following such crops as alfalfa where the soil is limed heavily. Where cotton follows alfalfa, it is often necessary to make a heavy application of potash fertilizer materials to the soil to prevent serious injury from potash deficiency or cotton rust.

"Where the rate of application of limestone ranges from 1,500 to 3,000 pounds, there is little danger of having serious trouble from a deficiency of available potash on the better agricultural soil types. If the soil is strongly acid, lime should be applied and in addition potash fertilizers where additional potash is necessary for a successful crop.

"Farmers should not be unduly concerned over a theoretical consideration of the effect of lime on the availability of the potash in the soil. The practical thing to do is to lime strongly acid soils and apply the fertilizers necessary in the economical production of crops."

Potash Supply Situation

Late in 1943 indications pointed to a supply of potash for agricultural use this year of less than the average amount consumed during the past two seasons. At this writing, however, it appears as though the situation has improved. More manure-salts will be available than was anticipated, and certain Lend-Lease commitments have been reduced. Thus, for the current season farmers are fairly certain that there will be sufficient potash to meet their most important agricultural needs.

It is the purpose of this discussion to review the potash experiments of South Carolina. The data used herein are largely taken from the Annual Reports of the Experiment Station.

Current market prices received for the various crops, and paid for potash, are used, rather than those of some predetermined base period. This is done because of the necessity for concern over the present welfare of agriculture. Estimated returns calculated on current prices received and paid by the

farmer will exceed, in most instances, those for pre-war conditions. Nevertheless, such data will be of value in serving to emphasize to the individual farmer the importance of adequate fertilization and at the same time impress agricultural leaders with the need for maintaining fertilizer supplies.

Certain of the major crops for which sufficient data are available will be considered. In general they are the leading crops from the standpoint of farm income.

Results of only three of the numerous potash experiments with cotton will be considered. The data are summarized in Table 1.

TABLE 1.—AVERAGE YIELDS OF SEED COTTON IN POUNDS PER ACRE FROM VARIOUS RATES OF POTASH FERTILIZATION

Treatment, 600 lbs. per acre	Lbs. of K_2O applied	Lbs. of seed cotton per acre	Lbs. increase for each rate	Lbs. increase per lb. of potash
Part A. Sandhill Experiment Station. Soil: Norfolk sand. Average 10 years.				
5-10-0	none	521	.....	.....
5-10-2.5	15	943	422	28.1
5-10-5	30	1,144	201	20.8
5-10-7.5	45	1,280	136	17.1
5-10-10	60	1,383	103	14.3
Part B. Pee Dee Experiment Station. Soil: Dunbar f. s. l. to Coxville f. s. l. Average 5 years.				
5-10-0	none	176	.....	.....
5-10-2.5	15	522	346	23
5-10-5	30	1,037	515	29
5-10-7.5	45	1,076	39	20
5-10-10	60	1,220	144	17
5-10-12.5	75	1,417	197	16
5-10-16.7	100	1,248	−169	11
Part C. Cooperative Experiments conducted on farms in the Piedmont. Soils: Cecil, Appling, Durham, Iredell, Alamance. Average 6 years.				
5-10-0	none	757	.....	.....
5-10-2.5	15	991	234	15.6
5-10-5	30	1,134	143	12.5
5-10-7.5	45	1,157	23	8.9
5-10-10	60	1,217	60	7.7
5-10-12.5	75	1,286	69	7.0

The response to potash fertilization as shown in the above table, for the various soils, is about as expected. The lighter sandy soils of the Coastal Plains gave relatively greater increases in seed cotton per pound of potash than the heavier Piedmont soils.

Translating the above responses to potash fertilization into returns per ton of 60 per cent muriate of potash, on the basis of current prices, the following results are obtained: In Part A, Table 1, it is seen that 30 pounds of potash produced 201 pounds more of seed cotton than 15 pounds, which amounts to 13.4 pounds of seed cotton for each pound of potash. Thus if a farmer used 30 pounds of potash per acre on Norfolk sand instead of 15 pounds, one ton of muriate would represent 16,080 pounds of seed cotton. Assuming that the seed cotton will yield 35 per cent lint (average is actually nearer 37%) this amounts to 5,628 pounds of lint, and 10,452 pounds of cottonseed. The season price of lint of staple length of one inch or longer has been 21¢ per pound

and cottonseed $52 per ton.[2] In terms of dollars these increases are equivalent to $1,182 for the lint, and $272 for the cottonseed, a total of $1,454. Deducting the current consumers' cash price, $50.85 per ton, for the muriate of potash, the balance is approximately $1,403. This means that on this soil a farmer could expect to realize this return from a ton of muriate of potash by fertilizing with 600 pounds per acre of a 5-10-15 rather than a 5-10-2.5. On a farm with 80 acres in cotton this $1,403 increase in income could be expected merely by applying 30 pounds of potash per acre instead of 15 pounds. Of course, there would be a small difference in net return due to the increased cost of harvesting and handling the larger per acre yields.

Similar calculations for the data from the Pee Dee Station, given in Part B, Table 1, which show an increase from 522 pounds of seed cotton with 15 pounds of potash to 1,037 pounds with 30 pounds of potash, an increase of 515 pounds of seed cotton, give the following results: Each pound of potash produces 34.3 pounds of seed cotton, and 1,200 pounds of potash (one ton of 60% muriate of potash) would represent a total of 41,160 pounds of seed cotton. This is equivalent to 14,406 pounds of lint and 26,754 pounds of cottonseed, with a monetary value of $3,025 and $696 respectively, or a total of $3,721. Deducting $50.85 for the cost of one ton of 60 per cent muriate of potash leaves a balance of approximately $3,670. In viewing this figure it should be kept in mind that this experiment was conducted on an unproductive site known to be especially deficient in potash.

The data in Part C, Table 1, representing the cooperative experiments conducted on Piedmont soils, show that 600 pounds of a 5-10-5 produced an average of 143 pounds of seed cotton more than 600 pounds of a 5-10-2.5. This is an increase of 9.53 pounds for each pound of potash. On this basis one ton of 60 per cent muriate of potash represents 10,978 pounds of seed cotton. This is equivalent to 3,842 pounds of lint and 7,138 pounds of cottonseed, with a monetary value of $807 and $187 respectively, or a total of $994, leaving a return of $943 after the cost of the potash is deducted.

These data show the increase in income that might be expected in cotton production on some of the major soils of this State. They are based on the increase in yields for 30 pounds of potash per acre over 15 pounds per acre. Had they been based on the difference between potash and no potash they would have been greater. Comparisons of 45 pounds with 30 pounds show considerable gains, especially on the Coastal Plain soils. Likewise, 60 pounds of potash produced very significant monetary gains over 45 pound applications on some of the lighter soils, however, they are less than for the previous comparison.

Time of Application

The experiments summarized in Parts B and C of Table 1 involved also time of application of potash to cotton as well as the rate of application. These data are omitted, but it might be pointed out that there were no significant differences in yields for the various times of application, that is, when all of the potash was applied under the crop, when all was applied as a side-dressing, or when split applications were used.

When the data of Part A, Table 1, are broken down into two five-year periods[3] an interesting observation can be made. With the two lowest rates of potash fertilization (none and 15 pounds per acre) the yields for the second period were lower than for the first period, averaging 213 and 139 pounds per acre less respectively. In

[2] Prices used are from the January 31, 1944 report, Prices Received by Farmers, U.S.D.A., Bureau of Agr. Economics, Office of Agricultural Statistician, Columbia, S. C., and are average prices for the season as reported.

[3] H. P. Cooper and W. H. Garman. Effect of applications of sodium on the composition and yield of cotton at different levels of potash fertilization. Soil Sci. Soc. of America Proc. 1942, Vol. 7: 331-338.

contrast, the yields for the 30, 45, and 60-pound rates averaged 107, 134, and 276 pounds more respectively during the second five years than during the first. From this it may safely be concluded that where ample amounts of nitrogen and phosphoric acid are applied for cotton on Norfolk sand, yields may be expected to decline with low rates of potash fertilization; whereas with 30 pounds or more per acre, the yields will be maintained, or even increased.

A large number of the experiments conducted with corn have been on farms where corn is grown in a rotation with cotton. In many such instances little response has been shown for the application of potash. This is especially true for the soils of the mountain regions. Typical results of potash experiments with corn are given in Table 2.

TABLE 2.—AVERAGE YIELDS IN BUSHELS OF SHELLED CORN PER ACRE FROM VARIOUS RATES OF POTASH FERTILIZATION

Treatment, 400 lbs. per acre	Lbs. of K_2O applied	Mountain soils. Congaree, and Toxaway. Ave. 5 yrs.	Coastal Plain soils	
			Norfolk, Ruston, Marlboro, and Orangeburg f. s. l. Ave. 4 yrs.	Norfolk sand. Ave. 3 yrs.
		Bushels of shelled corn per acre		
8–10–0	none	49.9	20.9	8.0
8–10–3.75	15	49.8	24.8	16.6
8–10–7.5	30	49.4	27.1	18.9
8–10–11.25	45	50.5	27.7	22.3
8–10–15	60	50.6	28.0	.....
8–10–18.75	75	48.8	29.7	.....
8–10–22.5	90	49.2	31.9	.....

The above data represent the average yields of shelled corn for a large number of experiments, each figure being the result of averaging more than 80 plots for a given year. No response was obtained on the low-lying soils of the mountain region; however, this should not be taken to mean that none of the mountain soils will respond to potash applications. Fields where considerable response to potash occurs are occasionally encountered.

The response of corn to potash fertilization was slight even on the sandy soils of the Coastal Plain. The average results of experiments on Norfolk, Ruston, Marlboro, and Orangeburg soils of sandy loam texture show an increase of 2.3 bushels per acre of shelled corn for the addition of 30 pounds of potash instead of 15 pounds. Though this figure is derived from a large number of separate tests, it is of minimum significance, but assuming it to be real, it would be equivalent to 0.16 bushel per pound of potash, or 9.96 pounds of shelled corn. Using the average price paid to farmers of $1.55 per bushel for corn, this increase (192 bushels) represents $298 for one ton of 60 per cent muriate of potash. After the price of the muriate of potash is deducted, a gain of $247 remains. This figure is small in comparison with those from other crops, but the average yields of corn in South Carolina are so low that any such small increase in production on the soils in question would be of very great importance.

Much of the land in corn each year receives no potash because the preceding crop, often cotton, has been fertilized

TABLE 3.—AVERAGE YIELDS OF SWEET POTATOES IN BUSHELS PER ACRE FROM VARIOUS RATES OF POTASH FERTILIZATION

Treatment, 1,000 lbs. per acre	Lbs. of K_2O applied	Bushels per acre		Bushels increase per lb. of potash	
		Total	U. S. No. 1	Total	U. S. No. 1
Part A. Sandhill Experiment Station. Average 5 years.					
4–8–0	none	137	91		
4–8–4	40	170	124	0.825	0.825
4–8–8	80	189	142	0.650	0.637
4–8–12	120	200	153	0.525	0.517
Part B. Pee Dee Experiment Station. Average 9 years.					
500 lbs. per acre					
3–8–0	none	152	86		
3–8–3	15	162	104	0.666	1.20
3–8–6	30	176	111	0.80	0.833
3–8–9	45	179	107	0.60	0.469
3–8–12	60	186	114	0.566	0.466
3–8–15	75	179	109	0.36	0.307
Part C. Edisto Experiment Station. Average 3 years.					
1,000 lbs per acre					
3–8–0	none	203	131		
3–8–4	40	212	135	0.225	0.01
3–8–12	120	242	139	0.325	0.066
3–8–16	160	232	129	0.181	none
3–8–20	200	222	122	0.095	none

with potash. From the above data for the same soils, if the yields from the 30-pound application of potash are compared with those where no potash was added, the increase is 6.2 bushels of shelled corn, or 0.207 bushel for each pound of potash. On this basis one ton of 60 per cent muriate of potash will produce 248 bushels of shelled corn, worth $384, leaving $333 after the cost of the potash is deducted. On Norfolk sand the response to the initial 15 pounds of potash amounted to 8.6 bushels, or slightly more than the yield of 8.0 bushels obtained without potash. In this case if 15 pounds of potash were used instead of no potash an increase of 0.573 bushel of shelled corn could be expected for each pound of potash, which amounts to, in terms of one ton of 60 per cent muriate of potash, 688 bushels, worth $1,066, or approximately $1,015 after the cost of the potash is deducted.

Potash experiments with sweet potatoes have been conducted at three locations on Coastal Plain soils. The results are given in Table 3.

As did cotton and corn, sweet potatoes showed more response to potash fertilization on the Norfolk sand at the Sandhill Station than at the other locations. Considering the yields of No. 1 potatoes in Part A, Table 3, it is seen that 80 pounds of potash produced 142 bushels, and 40 pounds produced 124 bushels, a difference of 18 bushels for the additional 40 pounds of potash. This amounts to a yield gain of 0.45 bushel per pound of potash. On this basis one ton of 60 per cent muriate of potash would produce 540 bushels of No. 1 sweet potatoes. In the 1943-44 season the price received by the commercial grower for No. 1 potatoes has varied from $3 to $5 per bushel. Taking the lower figure, the 540 bushels would be worth $1,620, or a net of $1,569 after the cost of the ton of muriate of potash is deducted. Thus, under these conditions one might expect to realize comparable returns by using 1,000

pounds of 4-8-8 per acre on 30 acres of sweet potatoes instead of 1,000 pounds per acre of 4-8-4 fertilizer on the same area. This takes into account only the No. 1 potatoes.

At the Pee Dee Station the only significant difference was that between the yield of No. 1 sweet potatoes from 500 pounds of 3-8-3 over 500 pounds of 3-8-0, which amounted to an average of 18 bushels annually over the nine-year period. Additional amounts of potash did not increase the yield of No. 1 potatoes. However, there were slight gains in the total yields up to the 60-pound rate of potash fertilization. If the total yields from 500 pounds per acre of 3-8-12 are compared with those from 500 pounds of 3-8-3, there is a difference of 24 bushels of sweet potatoes per acre. The additional 45 pounds of potash therefore produced 0.533 bushel per pound of potash. One ton of 60 per cent muriate of potash thus would produce an increase of 640 bushels in total yield. Assuming that the average selling price of these potatoes would be $1.80, the increase would amount to $1,152, or a gain of $1,101 after the price of the potash is subtracted. For these same treatments the yields of No. 1 potatoes differed by only 10 bushels per acre.

The results obtained at the Edisto Station are similar to the above in that there were no significant differences in the yields of No. 1 sweet potatoes. However, the total yields were increased by potash applications up to the 120-pound rate. The 1,000-pound treatment of 3-8-12 fertilizer produced 242 bushels of potatoes while the same amount of 3-8-4 produced 212 bushels, a difference of 30 bushels. The additional 80 pounds of potash, therefore, produced 0.375 bushel for each pound of potash. Calculating as before, one ton of 60 per cent muriate would result in a total increase in yield of 450 bushels of sweet potatoes, which at $1.80 per bushel would be worth $810. Deducting the cost of the potash, this represents a gain of $759. Thus on 15 acres of sweet potatoes a gain of this amount might be expected from the use of 1,000 pounds per acre of 3-8-12 fertilizer instead of the same amount of 3-8-4 per acre.

The only experimental work on the fertilization of peaches has been done at the Sandhill station on Norfolk coarse sand.[1] In this experiment the rate of fertilization was not varied, but consisted of treatments where nitrogen, phosphorus, and potassium were omitted singly. The data are given in Table 4.

The no-potassium plots (nitrogen plus phosphorus) yielded less than the nitrogen plus potassium plots every year, and especially the last four years. In 1938 these plots yielded less than the no-fertilizer treatment. The quality of the no-potash fruit was very inferior

[1] Scott, L. E. American Soc. for Horticultural Science, Proceedings, 36: 56-60 (1938).

TABLE 4.—YIELD OF PEACHES IN POUNDS PER TREE FOR DIFFERENT FERTILIZER TREATMENTS. SANDHILL STATION. AVERAGE 6 YEARS

Treatment	*Average yields, lbs. per tree	Remarks
No fertilizer	36.3	Complete treatment consisted of: 0.10 lb. NH_3, 0.05 lb. P_2O_5, and 0.05 lb. K_2O per tree per year for first 3 years, and 0.80 lb. N, 0.40 lb. P_2O_5, and 0.40 lb. K_2O per tree per year thereafter. Partial treatments used same rates.
Nitrogen (−PK)	46.8	
Nitrogen plus phosphorus (−K)	61.6	
Nitrogen plus potassium (−P)	96.1	
Complete	109.5	

* Difference of 11.6 pounds required for significance.

and many of the peaches failed to develop normally. The nitrogen plots averaged 46.8 pounds per tree, while those receiving potash in addition yielded 96.1 pounds per tree, a difference of 49.3 pounds for the 0.40 of potash. There were approximately 100 (actually 108) trees per acre, so that this increase in yield would amount to 4,930 pounds of peaches per acre as the result of applying 40 pounds of potash. Thus each pound of potash produced 123.25 pounds of peaches, or 2.465 bushels. Applying one ton of 60 per cent muriate of potash at the rate of 40 pounds of potash per acre to an orchard of 30 acres, on this basis, would result in an increase of 2,958 bushels of peaches. The price received by farmers this past year averaged $5.00 per bushel for "orchard run", including all sizes and culls. This price is abnormally high and is much out of line with the advance in prices of other farm products. For this reason a more representative figure will be used to calculate the returns due to the addition of potash in this experiment. If the crop of peaches had not been greatly reduced by late freezing last spring, the price would likely have been nearer $1.50 to $2.00 per bushel. Using the lower figure, the above increase in yield per ton of 60 per cent muriate of potash would amount to $4,437, or $4,386 after the potash was paid for. In this case the added cost for handling the larger harvest would be appreciable so that the net return would not be this large; however, it is obvious that it would still be very great. This comparison may have little significance. Here nitrogen only is compared with nitrogen plus potash. On Norfolk sand it would be most uneconomical to attempt to maintain a peach orchard without applying potash. But, the data will serve to show just what could be expected to be lost if a grower on this soil omitted potash from his peach orchard. His yields would not only be low, but the quality of fruit produced would not sell at near the market price.

Comparing the nitrogen plus phosphorus treatment with the nitrogen plus potassium there is a difference of 34.5 pounds of peaches per tree in favor of the potash treatment. This is equivalent to 69 bushels per acre from the 40 pounds of potash applied, or 1.725 bushels per pound of potash. One ton of 60 per cent muriate of potash would produce an increase in the crop of 2,070 bushels which at $1.50 per bushel would amount to a crop worth $3,105, and when the cost of the potash is deducted give a return of $3,054. Here again this would not represent actual profit due to the added cost of handling the larger yields.

Complete Fertilizer

The real effect of applying potash can perhaps be more accurately observed by comparing the complete treatment with the nitrogen plus phosphoric acid treatment. The former averaged 109.5 pounds of peaches per tree while the latter averaged only 61.6 pounds. The difference of 47.9 pounds can be ascribed as due to difference in treatment, which was 0.40 pound of potash per tree. Calculating as before, this would amount to a gain in yield of approximately 4,790 pounds of peaches per acre. This is equivalent to 95.8 bushels due to the addition of 40 pounds of potash per acre, or 2.395 bushels for each pound of potash. In this case one ton of 60 per cent muriate of potash applied at the rate of 40 pounds of potash per acre, to an orchard of 30 acres, in addition to nitrogen and phosphoric acid fertilization, would increase production by approximately 2,874 bushels. At $1.50 per bushel this would represent an increased crop worth $4,311 or $4,260 after the cost of the potash is accounted for. This is only slightly less than the calculated return of $4,386, where the potash plus nitrogen treatment was compared with nitrogen alone.

It is apparent that the effect of potash fertilization on peaches on this soil is very pronounced. Regardless of the price of peaches, an increase in produc-

tion of 90 bushels or more per acre would be quite profitable if it could be obtained merely for the cost of applying 67 pounds of 60 per cent muriate of potash per acre.

In these comparisons it should be remembered that potash versus no potash data are used. Data are not available to show the response of peaches to increasing amounts of potash.

Although tobacco is neither a food nor a feed crop, it ranks high in importance. It is doubtful if the war could be conducted as efficiently if the supply of tobacco at the fighting fronts should become limited. The economy of certain sections of several Southern States is very closely related to the production of tobacco.

In South Carolina alone there are annually about 100,000 acres in flue-cured tobacco. This is approximately one-tenth of the entire acreage devoted to cotton in this State.

The data given in Table 5 illustrate typical results obtained from fertilizer experiments with tobacco.

The results of this experiment, reported in the Fifty-Fourth Annual Report of the South Carolina Experiment Station, were summarized by J. F. Bullock as follows: "Although the results obtained . . . are not entirely consistent, they seem to indicate that under the conditions of the test a considerable increase in the value of the tobacco crop may be expected from an increase in the rate of potash fertilization up to at least 120 pounds of potash per acre, provided the potash is applied in the form of sulfate. The increase in value of the crop was due partly to increase in yield and partly to improvement in quality. Where sources of potash other than the sulfate were used, approximate maximum benefit was obtained with 60 pounds of potash per acre. When only 30 pounds of potash per acre were applied, the crop showed symptoms of potash hunger. There was no significant decline in quality of the cured leaf when as much as 240 to 300 pounds of potash per acre were used, and in fact the results indicate that if the sulfate is used, beneficial results may be obtained from these high rates of fertilization."

Considering the results for the 60, 120, and 300-pound rates of potash fertilization, where sulfate of potash was used, the per acre yields and value of the crop, as shown in Table 5 are: 1,503 pounds of tobacco worth $215.24, 1,487

TABLE 5.—YIELD OF FLUE-CURED TOBACCO IN POUNDS PER ACRE, AND CORRESPONDING VALUE OF THE CROP FOR VARIOUS SOURCES AND RATES OF POTASH FERTILIZATION. PEE DEE EXPERIMENT STATION. MARLBORO SANDY LOAM. AVERAGE 5 YEARS

*Source of potash applied in fertilizer	**Pounds of K_2O per acre	Pounds of tobacco per acre	Value of leaf per 100 pounds	Acre value of crop
			Dollars	*Dollars*
Nitrate of potash	30	1,386	15.20	210.62
Nitrate of potash	60	1,506	15.24	229.47
Carbonate of potash	60	1,471	14.61	214.98
Sulfate of potash	60	1,503	14.32	215.24
Nitrate, 1/3; carbonate 1/2	120	1,490	15.42	231.24
Nitrate of potash	120	1,457	15.85	230.99
Sulfate of potash	120	1,487	16.56	246.28
Nitrate, 1/4; carbonate, 2/3	180	1,548	14.80	229.08
Nitrate, 1/6; carbonate, 3/4	240	1,522	16.15	245.84
Nitrate, 1/7; carbonate, 4/5	300	1,512	14.56	220.18
Sulfate of potash	300	1,666	15.72	261.89

* All plots received the following: 30 lbs. nitrogen, 80 lbs. phosphoric acid, 65 lbs. calcium oxide, 20 lbs. of chlorine, and 0.5 lb. of boron.

** Of the total quantity of potash indicated, 20 lbs. were in all cases derived from muriate of potash.

pounds worth $246.28, and 1,666 pounds worth $261.89, respectively. Though the yields did not increase consistently, as previously pointed out, there was an increase in the per acre value of the crop produced. In flue-cured tobacco production quality is one of the first objectives. The 120-pound rate of potash fertilization produced tobacco worth $31 per acre more than the 60-pound rate, while with 300 pounds the crop was worth $15.61 more per acre than where 120 pounds of potash per acre were applied. The average farmer uses about 60 pounds of potash per acre for flue-cured tobacco. According to these data, if he used 60 additional pounds he could expect to get approximately $31 per acre more for his crop. Applying one ton of 50 per cent sulfate of potash at the rate of 60 pounds of potash per acre would cover 16.7 acres. Thus, if a farmer had 16.7 acres of tobacco and applied 120 pounds of potash instead of 60 pounds per acre, he might expect to get a crop worth approximately $518 more than without the extra 60 pounds of potash per acre. After the cost of the one ton of 50 per cent sulfate of potash is deducted, this would amount to around $464. On the basis of the data in Table 5, this would represent actual gain because all of the profit would have to be considered as due to improved quality and not to increased yields.

Potash and Other Crops

Experiments involving rate of application of potash have been conducted with such additional crops as tomatoes, Irish potatoes, asparagus, beans, cabbage, oats, oat hay, and soybean hay.

The experiments with tomatoes, Irish potatoes, beans, and cabbage have been conducted in the trucking areas along the coast. Truck crops have been produced in these areas for many years and the rotation of tomatoes, cabbage, potatoes, and beans widely used. In the main trucking centers there has been little need for new land to be put into production. For years heavy applications of fertilizer have been made to these soils, most fields receiving 1,000 to 1,500 pounds of complete fertilizer in the spring and again in the fall. Experiments with these crops have been conducted on representative truck soils, and not on new untreated land, in order that growers changing from one crop to another may have some idea as to the fertilizer requirements of the crop to be grown. The response that has resulted from potash has been mainly from the lower rates of application, with depressions in yield occasionally resulting from heavy applications. However, in some of these experiments where 2,000 pounds per acre of fertilizer are used, varying in analysis from 5-7-0 to 5-7-10, and all crops in the rotation fertilized, the reduced yields at the higher potash level may not be due to an over-supply of potash but to the total salt concentration.

On such soils as these, several years may be required to deplete the potash content to the point where the yields of the no-potash plots begin to decline. But, on the soils with lighter subsoils as found in the upper Coastal Plain, yields of most crops decline rapidly when potash is omitted.

At the Sandhill Station where 2,000 pounds of fertilizer per acre were applied to asparagus, with potash varied from zero to 300 pounds per acre, the yields of the no-potash plots declined each year in relation to the potash treatments. In 1937, the last year of the experiment, the 5-7-5 yielded 3,026 pounds of asparagus and the no-potash plots 2,316 pounds. Potash also exerted an appreciable influence on the percentage of the spears grading colossal, amounting to a net gain of 12 per cent of the total yield for the 5-7-5 over the 5-7-0 fertilizer. These results are from a four-year study. A longer period undoubtedly would have resulted in greater differences.

In an experiment at the Sandhill Station with soybean hay where 400 pounds per acre of 4-8-2, 4-8-4, and 4-8-8

(*Turn to page* 46)

Looking over the farm and getting yield data, but the farmer can give him only the prices of the past.

That Land Boom

By C. B. Sherman

U. S. Department of Agriculture, Washington, D. C.

UNRESTRAINED booms in farm-land values bode nobody permanent good. And they can and do hurt thousands in many walks of life. They hurt farm families most of all, in the long run. For what profit do better crops or bigger crops bring to the farmers who grow them if the land on which they are grown is mortgaged beyond the hilt?

Big prices for farm land may look good to farmers who would like to sell and to lenders who have put their money into farm mortgages. Speculators like them. But older farmers remember the excruciating results of the boom brought by the last war. Many farmers who had expanded their ownings for patriotic or other reasons faced bankruptcy. Farms that were apparently sold came back on the hands of previous owners who had retired or gone into other business. Huge acreages of farm lands went into the hands of non-resident corporations that did not really want them and that were thus forced to start competition with family-owned farms. Disaster was general.

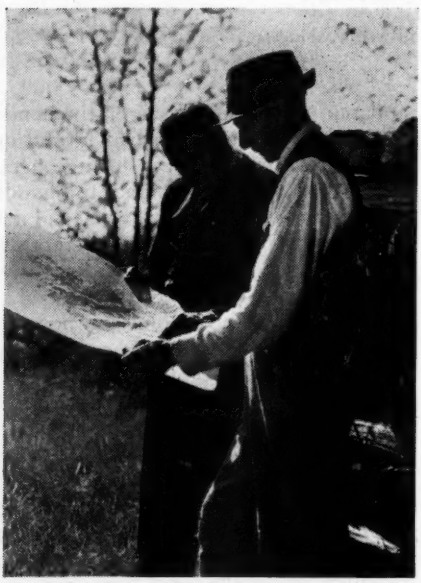
Signs of a land boom are now so evident that whether one is on the way is no longer the center of discussion but rather how to prevent or control it, according to Mark Regan, the man in the U. S. Department of Agriculture who has given most study and thought to these matters. Farm-land prices are going up almost as rapidly as during World War I. High prices for farm products, unusually large farm incomes, large liquid funds at the disposal of

farmers, and the buying of farm land by purchasers who are not farmers are among the obvious reasons. And there are no comparable curbing influences.

Farmers have been using much of their larger incomes to pay off their debts and many of the recent land sales have been for cash, so the total of farm-mortgage debt has been going down. But now reports are coming in showing that heavier debts are frequently being assumed when farms are bought, and this is especially true of tenants who are buying on contract or with a relatively small down payment.

If post-war prices for farm products do not drop excessively, post-war prices for land could be maintained without deplorable impacts. It may be the policy to attempt to maintain commodity prices at levels not much lower than wartime, but maintaining a given relation between prices for farm products and the general price level is particularly difficult to do, Mr. Regan points out.

It is hard to realize today, when the cry is for food and yet more food, but regardless of trade policy and work toward improved nutrition for the many, it is entirely possible that we may again face so-called agricultural surpluses.



This prospective buyer studies the farm lay-out, but what about post-war prices?

"Opinion as to the best measures for meeting these powerful influences has not fully crystalized, but there is general agreement that a boom is not wanted and the view is widespread that it should be prevented even though that may mean government action," says Mr. Regan.

"As the direction of events after the war is surrounded by uncertainties, the safer course is to control land prices now, slowing down the value of credit increases until we reach a better basis for predicting future incomes and prices. Adjustments then would be much less severe. It was about 10 years after the last war before land prices were such that they could be supported by earnings that could be reasonably expected from the land."

Effects on the war are also to be considered. The land market competes actively for the money that farmers might otherwise invest in war bonds. An excess number of land sales could interfere with achieving the food-production goals. Moreover, to prevent runaway prices of all capital assets, including farm land, is an integral part of the general program of inflation control.

But what about these measures that might be tried? Are they practicable? How would the public respond to them?

"They are practicable, I should say, and quite specific," says Mr. Regan. "The degree to which they would be acceptable to the public is still debatable."

Super-taxes on speculative gains could curb speculators and this approach is receiving increasing support as one means of curbing a land boom. Credit controls could keep mortgage loans within bounds. Taxes on land sales could hold down the number of sales and the increase in prices. Certain differentials could give preference to buyers who expect to farm the land

(*Turn to page* 46)

Soil Tests Indicate Potash Levels

By J. Fielding Reed

North Carolina Department of Agriculture, Raleigh, North Carolina

THE results of soil analyses made by the Soil Testing Division of the North Carolina Department of Agriculture offer a good insight into the general level of "available" potassium in various parts of the State. The need for a general survey of such information has arisen in connection with the necessity for using as efficiently as possible the potash available for agricultural use.

In the course of a year many soil samples are handled by this Division. A compilation has been made of the "available" potash content of soils received during the year 1942-1943. This data has been grouped according to agricultural areas and is presented in Table 1 and Figure 1. The yield response of various crops to potash applications in these same areas is discussed in a paper by Dr. R. W. Cummings, Head of the Agronomy Department at North Carolina State College, which will appear in a later issue of this magazine.

Some mention should be made of the type of samples from which this information is drawn. A rather thorough educational program in North Carolina has done much to reduce the number of improperly sampled soils that are sent in. The samples considered in compilation of this information do not include any garden or lawn areas and do not include too many from any one farm. For the most part, these samples were taken under supervision or instruction from this office or from the office of the County Agent, Soil Conservation Service, or Vocational Teacher. It is recognized that such samples are not as representative of an area as would be the case if the area were systematically sampled for a specific study of this soil. But the information furnished by the samples gives a survey of the comparative level of "available" potash in various parts of North Carolina.

The method in use at present for the determination of "available" potassium involves extraction with 0.05 N HCl and determination of potassium directly in the extract by precipitation as the cobalti-nitrite and estimation turbidimetrically. The details are described elsewhere, and it is sufficient to say that the procedure is quite satisfactory if proper precautions of temperature control, etc., are taken. The relative terms very low, low, etc., are used because experience has shown that our farmers find such relative terms easier to understand than estimates of the parts per million or pounds per acre. Translated in terms of parts per million of the soil the figures are approximately:

	p.p.m.K
High	Above 70
Medium	30–70
Low	15–30
Very Low	0–15

These are not suggested as figures for calibration in other localities. Varying the extractant or ratio of soil to extractant should give different results. The important point is the interpreta-

(*Turn to page* 44)

South Finds Clovers Excel in Profits

By F. J. Hurst

Administrative Ass't, Agricultural Adjustment Administration, Jackson, Mississippi

BECAUSE of their multiple value—for winter grazing, for erosion control, for soil-building, and for seed production—white clover, crimson clover, and red clover are increasing in popularity and acreage. From the brown loam sections of Mississippi and Louisiana to the fertile hills and alluvial valleys of Tennessee, Kentucky, and Virginia, these clovers are given an important place on many farms.

White clover is one of the leading pasture clovers of the South. The acreage annually seeded to this crop is increasing by leaps and bounds. It is best adapted to bottom soils, but will make a surprisingly fine growth on the better hill lands when fertilized with limestone and superphosphate or basic slag, and potash wherever needed. White clover fits ideally into the permanent pasture program because it furnishes abundant and nutritious grazing during the winter and early spring months when pasturage would otherwise be scarce on many farms.

In Claiborne, Adams, Jefferson, Warren, and other counties in the brown loam area in Mississippi and in the brown loam parishes in Louisiana, the production and harvesting of white clover seed, largely from permanent pastures, constitute an important enterprise on some farms and add to the total cash returns received from land in pasture. Claiborne county farmers alone harvested 90,000 pounds of white clover seed in 1943. Yields averaged around 100 pounds per acre, with 150-pound yields common where the clover had been fertilized. Gravity-run seed found a ready market at 50 to 65 cents a pound.

What this meant in cash income to producers is revealed by County Agent J. S. McKewen, Port Gibson, who reports that J. V. Gage harvested 6,000 pounds; Weil and Boston 25,000 pounds; Fred Wolcott 8,000 pounds; I. W. Carpenter 6,000; C. L. Nelson 3,500; D. M. Dowdell 3,000, and others from 1,000 to 2,500 pounds each.

County Agent E. L. Hobby of Jefferson county in 1943 harvested from 40 acres 4,500 pounds of cleaned white clover seed which tested 99.2 per cent pure. He reported, "Since June 10 when seed harvesting was completed on the 40 acres, we have grazed 1½ animal units per acre. With normal rainfall, these animals will continue grazing until field crops are harvested. They will then be shifted to the fields in November and December and then back to white clover until April 1 of next year. The 40-acre tract is good land and, in addition, received an application of 600 pounds of basic slag per acre last fall."

Hobby "doubts if any other crop will give so much grazing and still yield a seed crop valued at $40 per acre. After watching white clover carefully for three years, I have concluded that it is one of our most important pasture plants. It gives grazing nearly all winter and on the damper, more fertile soils provides grazing all summer."

When white clover is to be harvested for seed, animals are removed from the pasture about the middle of April to the first of May and the clover allowed

to mature seed, which is usually the latter part of May and the first days of June. Harvesting the seed serves as a cultivation of the pasture which in 10 days to two weeks will again be ready for grazing.

White clover is usually harvested for seed when 75 to 80 per cent of the heads are brown in color to thoroughly ripe. Most of the seed should shell out in the palm of the hand when rubbed. A common practice is to cut the crop with a mowing machine and leave it flat in the swath. The cutter bar should be about one foot narrower than combine. Care should be taken to have the mower in good shape with new ledger plates, good guards, and sharp blades. The clover should be cut close to the ground. A mixture of grasses makes the clover easier to cut.

By the middle of the third or fourth day without rain, the clover will be crispy dry and the seed will thresh out easily. A pick-up attachment should be used for taking the clover off the ground into the combine. If rains delay threshing, the clover may have to be raked before the second growth ties it down. A side-delivery rake is best. Only what the combine can handle in one day should be raked into small windrows after the dew has dried off in the morning. The seed should not be threshed before 10 o'clock in the morning, and it is usually necessary to stop about 4 or 5 o'clock in the afternoon.

Seeding White Clover

Farmers who desire to add white clover to established permanent pasture should sow 3 to 4 pounds of seed per acre on the pasture sod in October and cover the seed by light harrowing.

As a winter cover crop, white clover may be seeded on clean, cultivated corn or cotton land without previous preparation. But if a seed crop is to be harvested, the seed should be planted on a firm, smooth seedbed, which has been prepared by plowing, disking, harrowing, and dragging until the surface soil is finely pulverized and perfectly smooth. Rain should further firm the seedbed.

At least five pounds of seed should be sown in October or early November when moisture conditions are right. A grain drill with grass-seed attachment is ideal equipment for seeding. It is not necessary to cover the seed. Where a cultipacker is used, the little furrows will hold the seed in place. If the land is smooth, a section harrow can be used to form small furrows to hold seed in place and prevent drifting by heavy rains on sloping land.

Crimson Clover as a Winter-grazing Crop

In Mississippi, crimson clover probably rates tops as a winter-grazing crop on land to which it is adapted. The amazing carrying capacity of crimson clover planted on fairly fertile soil and fertilized was demonstrated during the past season by Howard Greene of Madison county. Mr. Greene seeded 84 acres to a mixture of oats and crimson clover early in September 1942, using 1½ bushels of oats and 15 pounds of crimson clover seed per acre on well-prepared land which was fertilized with 500 pounds of basic slag per acre.

The oats and clover were ready for grazing in early October, and a total of 100 head of yearlings, 175 sheep, and 50 hogs were grazed continuously on the area until April 20, 1943, when the animals were removed and the clover allowed to seed. An average of 400 pounds of seed per acre was harvested and sold for 11½ cents a pound, or $46 per acre.

The yearlings gained an average of 100 pounds per head and increased in value from $10 to $15 per hundred pounds. On June 5, he sold 83 lambs, which averaged 83.5 pounds each, for $967. The sheep and lambs received no other feed, but were grazed on permanent pasture after they were removed from the clover. The hogs were fed corn in addition to grazing. Around $1,000 worth of hogs was sold off the clover.

D. M. Dowdle of Claiborne county grazed 34 head of mature cattle during the entire winter and up to April 21 on 13 acres of crimson clover. The clover was then allowed to seed for harvest. After the seed were combined, the land was planted to sorghum for silage which would be ready for harvest in time to again plant the land to crimson clover.

Crimson Clover Checks Erosion

If the producer does not desire to save seed, the livestock should be removed in the spring in time to permit the growth and turning under of the clover as a green-manure crop. Crimson clover covers the entire area of the surface soil, provides perfect protection against erosion, and adds large quantities of humus and nitrogen to the soil when plowed under.

Crimson clover requires more fertile soil and better preparation of the seedbed than vetch or Austrian winter peas. Its use has been retarded because of the difficulty in obtaining good stands. The seed germinates very easily, but once sprouted, the little seedlings are easily injured or killed by subsequent drying. For this reason, crimson clover should not be seeded until there is enough moisture in the soil to allow the young plants to establish a good root system. For a cover crop or for grazing, crimson clover may be sown on corn or cotton land which has just been disked.

If a seed crop is desired or if the land is covered with considerable vegetation, a good seedbed should be prepared by thorough plowing, disking, harrowing, and packing or dragging. The soil should be prepared sufficiently in advance of seeding time to permit rains to firm the seedbed. This is important.

Crimson clover should be planted at the rate of from 15 to 20 pounds of seed per acre from late August in northern latitudes to early November in the lower portion of the Cotton Belt. A grain drill with grass-seed attachment or a grass-seed drill makes ideal seeding equipment.

Soils of medium fertility are best for seed production. Fields saved for seed should be grazed until April. This makes the plants stubby and stiff, and the clover will stand up straight for harvesting. Ungrazed clover on rich land will grow so tall that the plants, when mature, will fall to the ground and, if harvesting is delayed on account of rain or for any other reason, the seed crop will be lost.

If it is impracticable to graze the clover where seed is to be saved, seed patches may be mowed early in the spring. The mowing will have the same effect as grazing and give uniform maturity and ripening of seed over the field.

Crimson clover is easily harvested for seed. Straight combining is the most popular method, but the seed is also harvested by the combine, windrow-pick-up method.

The Uses of Red Clover

The acreage of red clover is still limited, but farmers who have suitable soil and who have used this crop for grazing, for soil-building, for hay production, and as a seed crop are highly pleased with the results obtained.

Red clover requires fertile to fairly fertile, sweet, well-drained soil. On the less fertile lands, the use of limestone and superphosphate or basic slag and potash where needed pays dividends in increased growth.

Farmers in certain territories, who have soil conditions where the mixture is adapted, have found that a combination of oats and red clover is valuable for grazing, for hay, and for seed. Successful growers claim that oats and red clover will furnish more grazing for hogs from May until August than any other combination they have ever used during this season of the year.

A common practice is to plant 5 to 6 pecks of oats per acre on a well-prepared seedbed in late September or early Octo-

(*Turn to page* 44)

Above: A 9-acre red clover pasture near Natchez, Miss., furnished continuous grazing for a flock of sheep and 30 dairy cows at night.

Below: These fine Hereford cattle are "mud" fat with no other feed than white clover pasture on a plantation near Port Gibson, Miss.

Above: The use of a cultipacker on a well-prepared seedbed will help get a better stand by holding the seed in the small furrows.

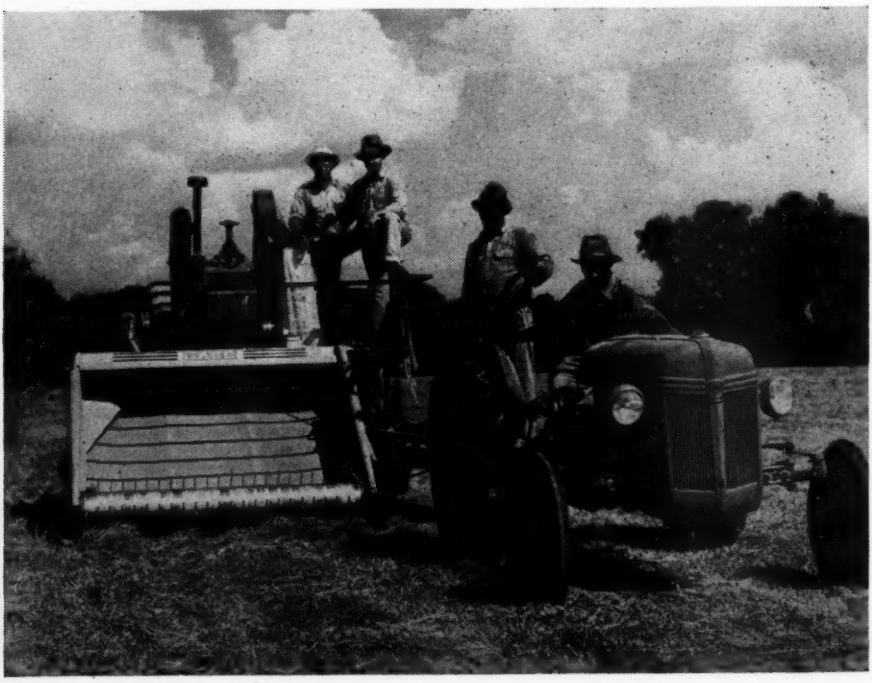
Below: A 96-acre field of white clover on April 27, 1943, which three weeks later yielded 5,700 lbs. of cleaned seed worth $3,500.

Above: A 6-year-old Dallis grass and white clover pasture in July after it had yielded a seed crop in June and then was grazed by cattle.

Below: A sample of crimson clover from a field which had furnished grazing for livestock and then produced 800 lbs. of seed per acre.

Above: This second growth red clover produced 2 tons of hay per acre in June and yielded a seed crop in August. Cattle were grazed on the clover from January to April.

Below: Harvesting white clover seed in Claiborne county, Miss., requires less labor with equipment such as this.



The Editors Talk

Agriculture Post-war

"There are good reasons for believing that many factors in the post-war period will make for the kind of agriculture our farmers, and Americans generally, want in the United States. On the other hand, it seems almost certain that other factors will make it difficult to achieve this kind of agriculture. If this is true, the obligation rests upon all of us to clarify our thinking, agree upon what we want, and set about doing the job."

The above is part of an introductory statement by Secretary of Agriculture Claude R. Wickard in the newly published report of the U. S. Department of Agriculture's Interbureau and Regional Committees on Post-war Programs. "What post-war policies for Agriculture?" the Committees asked themselves, and then proceeding on the premise that the over-all objective of government should be adequate food and fiber for all at prices fair to both consumers and producers, worked out a set of goals which the Secretary believes "might well serve as a stimulus to our thinking and a basis for discussion concerning the national agricultural policy after the war."

For the benefit of our readers, these goals are listed briefly:

1. Adequate Food and Fiber for All
2. Parity Income for Farmers
3. Parity of Public Services and Facilities for All Rural People
4. Better Marketing at Lower Cost
5. Dominance of Family Farms
6. Good Land-tenure Conditions
7. Reclamation and Cultivation of Potentially Good Land
8. Employment and Security for Part-time Farmers and for "Rural Residents"
9. Fertile Soils and Luxuriant Forests
10. High Level of Industrial Activity
11. Freer International Trade
12. By the Democratic Process.

In explanation of No. 12, the authors say, "In this attempt to put on paper what we think national agricultural policy after the war ought to be, we harbor no illusions as to how such policy will actually be made. We know it will, and believe it should, be evolved by the democratic and political process of group action, discussion, trial and error."

Space here does not permit comment on the discussion of the need for each of these goals, as contained in the Report. Nos. 7 and 9 pertain particularly to the soil, which after all is the basis of all agriculture. Under No. 7, it is pointed out that too many of our farmers are now condemned to perennial poverty by undertaking to farm soils which, under the present state of our techniques, are

too poor to yield a living that will meet minimum standards. Much of this land is of such low productivity and so highly erodible that it never should have been farmed; other portions were originally productive but have been badly misused. Additional scientific attainments in cultivation and processing and the more effective use of land already in farms will help meet an increasing demand for food for the nutritional needs of our own population and the potential world-wide outlet for farm products; but it is almost certain that additional farm areas will be needed.

Fortunately, in the United States, according to the Committees, there are 30 to 40 million acres of intrinsically good land which can be made available for settlement, if the need for farm products is too large to be met satisfactorily by land already in farms. Of this total, from 10 to 20 million acres can be reclaimed in the Western States through irrigation, and another 5 million acres of fertile land in the Mississippi Delta can be made available through drainage and clearing. Approximately 15 million acres that require drainage and clearing are located at various other points over the country.

It is pointed out that as 3 million of our present 6 million farms produce about 90 per cent of our marketed farm produce, even a net addition to our agricultural plant of the total area of potentially good land would add only about 300,000 farms of average size and would increase our total output by only about 10 per cent. Such a program, however, would provide substantial settlement opportunities for some of our ex-service men, especially some of those who came from farms, and would constitute an important part of any temporary public works that might be required to assure full employment during demobilization.

Discussing conservation under No. 9, the Committees propose a country with the soil of every acre properly conserved and managed; all forest and range land so handled as to yield continuously an abundance of forest and range products and to provide adequate recreational facilities. To accomplish these objectives, all possible private action should be taken—and national, State, and local programs for soil, water, forest, range, and wildlife conservation should be expanded and put into effect as rapidly as possible. This will involve expanded research, improved management of public lands, the development of public restrictions against the misuse of privately owned lands, the active public use of lands that would otherwise be idle, and, in extreme cases, condemnation proceedings and public or private sale. It will call for the transfer to public ownership of forest lands that are submarginal for permanent private ownership, for expanding public aid to private forest owners, and for public works for the rehabilitation of depleted lands.

The Report should be carefully read and studied not only by those connected with Agriculture, but by everyone interested in the post-war welfare of this country. As Secretary Wickard hoped, it does serve as a "stimulus to our thinking." And it is time now to be putting some of our thoughts into action.

PRECIOUS soil, I say to myself, by what singular custom of law is it that thou wast made to constitute the riches of the freeholder? What should we American farmers be without the distinct possession of that soil? It feeds, it clothes us, from it we draw even a great exuberancy, our best meat, our richest drink; the very honey of our bees comes from this privileged spot. No wonder we should thus cherish its possession.—*Letters from an American Farmer, 1782.*

Farm Prices of Farm Products*

	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
1910–14 Average	12.4	10.4	69.6	87.6	64.8	88.0	11.94	21.59	....
1920	32.1	17.3	249.5	175.7	144.2	224.1	21.26	51.73	....
1921	12.3	19.5	103.8	118.7	58.7	119.0	12.96	22.18	....
1922	18.9	22.8	96.7	104.8	58.5	103.2	11.68	35.04	...
1923	26.7	19.0	84.1	104.4	80.1	98.9	12.29	43.69	....
1924	27.6	19.0	87.0	137.0	91.2	110.5	13.28	38.34	....
1925	22.1	16.8	113.9	171.6	99.9	151.0	12.54	35.07	....
1926	15.1	17.9	185.7	156.3	69.9	135.1	13.06	27.20	....
1927	15.9	20.7	132.3	114.0	78.8	120.5	12.00	28.56	....
1928	18.6	20.0	82.9	112.3	89.1	113.4	10.63	37.70	....
1929	17.7	18.6	93.7	118.4	87.6	102.7	11.56	34.98	....
1930	12.4	12.9	124.4	115.8	78.0	80.9	11.31	26.25	....
1931	7.6	8.2	72.7	92.9	49.8	48.8	9.76	17.04	....
1932	5.8	10.5	43.3	57.2	28.1	38.8	7.53	9.74	....
1933	8.1	12.9	66.0	59.4	36.5	58.1	6.81	12.32	....
1934	12.0	17.1	68.0	79.1	61.3	79.8	10.67	26.12	....
1935	11.6	16.1	49.4	73.9	77.4	86.4	10.57	35.56	....
1936	11.7	17.2	99.6	85.3	76.7	96.0	8.93	31.78	....
1937	11.1	19.9	88.3	91.8	94.8	107.1	10.36	30.24	....
1938	8.3	17.2	55.5	76.9	49.0	66.1	7.55	21.13	....
1939	8.7	13.6	68.1	75.4	47.6	63.6	6.95	22.17	....
1940	9.6	15.1	70.7	85.2	59.0	73.9	7.62	24.31	....
1941	13.3	19.1	64.6	94.4	64.3	84.0	8.10	35.04	....
1942	18.51	28.3	110.0	108.3	79.5	101.8	10.05	44.42	....
1943									
February	19.68	18.2	125.7	129.8	90.4	119.5	11.94	44.88	....
March	19.91	16.0	145.1	153.6	94.8	122.7	12.28	45.73	....
April	20.13	16.0	166.8	179.2	100.2	122.3	12.61	45.89	....
May	20.09	37.6	190.7	225.1	103.4	122.8	12.66	46.11	....
June	19.96	57.0	188.0	222.0	106.0	124.0	12.20	46.40	....
July	19.60	59.0	167.0	267.0	108.0	126.0	11.90	44.50	....
August	19.81	38.4	159.0	276.0	109.0	127.0	12.20	50.90	....
September	20.20	37.2	134.0	231.0	109.0	130.0	12.90	51.90	....
October	20.28	41.8	128.0	196.0	107.0	135.0	13.70	52.50	....
November	19.40	44.5	133.0	177.0	105.0	137.0	14.50	52.50	....
December	19.85	42.4	135.0	188.0	111.0	143.0	15.20	52.60	....
1944									
January	20.15	41.5	141.0	202.0	113.0	146.0	15.70	52.80	....
February	19.93	25.1	139.0	211.0	113.0	146.0	15.90	52.60	....

Index Numbers (1910-14 = 100)

1920	259	166	358	201	223	255	178	240	....
1921	99	187	149	136	91	135	109	103	....
1922	152	219	139	120	90	117	98	162	....
1923	215	183	121	119	124	112	103	202	....
1924	223	183	125	156	141	126	111	177	150
1925	178	161	164	196	154	172	105	162	153
1926	122	172	267	178	108	154	109	126	143
1927	128	199	190	130	122	137	101	132	121
1928	150	192	119	128	138	129	89	175	159
1929	143	179	135	135	135	117	97	162	149
1930	100	124	179	132	120	92	95	122	140
1931	61	79	104	106	77	55	82	79	117
1932	47	101	62	65	43	44	63	45	102
1933	65	124	95	68	56	66	57	57	105
1934	97	164	98	90	95	91	89	121	104
1935	94	155	71	84	119	98	89	165	126
1936	94	165	143	97	118	109	75	147	113
1937	90	191	127	105	146	122	87	140	122
1938	67	165	80	88	76	75	63	98	101
1939	70	131	98	86	73	72	58	103	109
1940	78	145	102	97	91	84	64	126	121
1941	107	184	93	108	99	95	68	162	145
1942	149	272	158	124	123	116	84	206	199
1943									
February	159	175	181	148	140	136	100	208	301
March	161	154	208	175	146	139	103	212	302
April	162	154	240	205	155	139	106	213	291
May	162	362	274	257	160	140	106	214	253
June	161	548	270	253	164	141	102	215	308
July	158	567	240	305	167	143	100	206	315
August	160	369	228	315	168	144	102	236	308
September	163	358	193	264	168	148	108	240	311
October	164	402	184	224	165	153	115	243	264
November	156	428	191	202	162	156	121	243	254
December	160	408	194	215	171	163	127	244	208
1944									
January	163	399	203	231	174	166	131	245	231
February	161	241	200	241	174	166	133	244	204

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated, 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.71	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
1943							
February	1.75	1.42	5.83	5.77	3.34	4.86	6.53
March	1.75	1.42	6.30	5.77	3.34	4.86	6.53
April	1.75	1.42	6.29	5,77	3.34	4.86	6.53
May	1.75	1.42	6.29	5.77	3.34	4.86	6.53
June	1.75	1.42	6.30	5.77	3.34	4.86	6.53
July	1.75	1.42	6.30	5.77	3.34	4.86	6.71
August	1.75	1.42	6.30	5.77	3.34	4.86	6.71
September	1.75	1.42	6.30	5.77	3.34	4.86	6.71
October	1.75	1.42	6.29	5.77	3.34	4.86	6.71
November	1.75	1.42	6.29	5.77	3.34	4.86	6.71
December	1.75	1.42	7.39	5.77	3.34	4.86	6.71
1944							
January	1.75	1.42	7.40	5.77	3.34	4.86	6.71
February	1.75	1.42	7.40	5.77	3.34	4.86	6.71

Index Numbers (1910-14 = 100)

1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	136	129	139
1927	112	79	145	166	143	128	162
1928	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	112	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	121
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
1943							
February	65	50	167	163	110	144	186
March	65	50	180	163	110	144	186
April	65	50	180	163	110	144	186
May	65	50	180	163	110	144	186
June	65	50	180	163	110	144	186
July	65	50	180	163	110	144	191
August	65	50	180	163	110	144	191
September	65	50	180	163	110	144	191
October	65	50	180	163	110	144	191
November	65	50	180	163	110	144	191
December	65	50	211	163	110	144	191
1944							
January	65	50	211	163	110	144	191
February	65	50	211	163	110	144	191

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.535	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	25.17	.572	.623
1939	.478	1.90	5.50	.521	.751	24.52	.570	.607
1940	.516	1.90	5.50	.517	.730	....	.573	....
1941	.547	1.94	5.64	.522	.779	25.55	.570	....
1942	.600	2.13	6.29	.522	.809	25.74	.205	....
1943								
February	.600	2.00	5.90	.535	.817	26.00	.210	....
March	.608	2.00	5.90	.535	.817	26.00	.210	....
April	.640	2.00	5.90	.535	.817	26.00	.210	....
May	.640	2.00	5.90	.535	.817	26.00	.210	....
June	.640	2.00	5.90	.471	.701	22.88	.176	....
July	.640	2.00	5.90	.503	.797	26.00	.188	....
August	.640	2.00	5.90	.503	.797	26.00	.188	....
September	.640	2.00	5.90	.503	.797	26.00	.188	....
October	.640	2.00	5.90	.535	.797	26.00	.200	....
November	.640	2.00	5.90	.535	.797	26.00	.200	....
December	.640	2.00	6.10	.535	.797	26.00	.200	....
1944								
January	.640	2.00	6.10	.535	.797	26.00	.200	....
February	.640	2.00	6.10	.535	.797	26.00	.200	....

Index Numbers (1910-14 = 100)

1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1924	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	....	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	110	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	....	87	....
1941	102	54	110	73	82	106	87	....
1942	112	59	129	73	85	106	84	....
1943								
February	112	55	121	75	86	108	85	....
March	113	55	121	75	86	108	85	....
April	119	55	121	75	86	108	85	....
May	119	55	121	75	86	108	85	....
June	119	55	121	66	74	95	80	....
July	119	55	121	70	84	108	82	....
August	119	55	121	70	84	108	82	....
September	119	55	121	70	84	108	82	....
October	119	55	121	75	84	108	83	....
November	119	55	121	75	84	108	83	....
December	119	55	125	75	84	108	83	....
1944								
January	119	55	125	75	84	108	83	....
February	119	55	125	75	84	108	83	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates[1]	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	142	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	157	151	112	100	131	109	80
1926.....	145	155	146	119	94	135	112	86
1927.....	139	153	139	116	89	150	100	94
1928.....	149	155	141	121	87	177	108	97
1929.....	146	153	139	114	79	146	114	97
1930.....	126	145	126	105	72	131	101	99
1931.....	87	124	107	83	62	83	90	99
1932.....	65	107	95	71	46	48	85	99
1933.....	70	109	96	70	45	71	81	95
1934.....	90	123	109	72	47	90	91	72
1935.....	108	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	121	130	126	81	50	129	95	75
1938.....	95	122	115	78	52	101	92	77
1939.....	93	121	112	79	51	119	89	77
1940.....	98	122	115	80	52	114	96	77
1941.....	122	130	127	86	56	130	102	77
1942.....	157	152	144	93	57	161	112	77
1943								
February..	178	162	149	92	57	155	112	79
March.....	182	163	150	93	57	160	113	79
April.....	185	165	151	95	57	160	119	79
May.....	187	167	152	95	57	160	119	79
June.....	190	168	151	93	57	160	119	69
July.....	188	169	150	94	57	160	119	74
August....	193	169	150	94	57	160	119	74
September.	193	169	150	94	57	160	119	74
October...	192	170	150	95	57	160	119	78
November.	194	171	150	95	57	160	119	78
December..	196	173	150	96	57	171	119	78
1944								
January....	196	174	150	96	57	171	119	78
February..	195	175	151	96	57	171	119	78

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* U. S. D. A. figures.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.

**** The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ The inadequacy of data on fertilizer consumption in this country is being corrected more rapidly in recent years under the impetus of wartime necessity for exact information on fertilizer usage and requirements. An excellent contribution to the subject is "Fertilizer Consumption in 1941 and Trends in Usage" by A. L. Mehring and Grace T. Vincent, U. S. Department of Agriculture Circular 689. The authors compiled their data on the basis of a questionnaire survey and by the utilization of all published figures by state, federal, and trade agencies. The data obtained for 1941 are compared with those for previous years, bringing out any interesting and significant facts. Fertilizer is now reported to be consumed in each state and the District of Columbia—only two states, South Dakota and Nevada, reporting less than 1,000 tons. The South Atlantic states are still the largest consumers of fertilizer, although their relative proportion of the total consumption for the country is much less than formerly, due to marked increases in other sections, particularly the East North Central, South Central, and Western states. About 60% of total consumption over the country is in the form of mixed fertilizer with the other 40% straight materials. This fertilizer was prepared and distributed by more than 700 companies operating about 1,000 plants. Of the mixed fertilizers, over 90% is in the form of so-called complete fertilizers, containing nitrogen, phosphate, and potash. The phosphate-potash mixtures comprised 5.7% of the total. The nitrogen-potash mixtures, while relatively small, have increased considerably within the last several years.

The survey indicated that at least 651 different grades of mixed fertilizers were sold during 1941. Probably the number was closer to 900, but even this large figure represents some improvement over previous years, when well over 1,000 grades were on the market. It may be stated that under wartime requirements, the number of grades has been drastically reduced below the number shown in this survey. The most popular grade over the country as a whole is the 2-12-6 fertilizer and it is the leading grade in the Middle Atlantic and Midwestern states. The 5-8-12 is the leading grade in New England states, with 4-8-4 the leading grade in the South. Grades which are losing in popularity are the 5-8-7 in New England, the 2-9-5 in the Middle Atlantic states, the 3-8-3 in the Southern states, and the 0-14-6 in the Midwestern states, where the 0-12-12 and 3-12-12 are gaining in popularity. There is a decided trend toward greater concentration of plant food in fertilizers, with the average in 1941 being 19.4 units of plant food compared to 17.5 in 1935, and 13.8 in 1910.

Ammonia and its salts have become the principal source of nitrogen, with a big decrease in natural organics, a moderate decrease in nitrates, and an increase in organic chemicals used in making mixed fertilizers. Superphosphate continues to be by far the most important source of phosphoric acid. Muriate of potash is the principal source of potash, with a decided trend in recent

years toward the concentrated 60% grade as contrasted to the 50% grade used during the 20's and early 30's. There has been a decided drop in the lower grade potash materials such as kainite and manure salts, although this has been temporarily reversed during the last year because of war necessity. In the use of straight materials, nitrate of soda is the most popular nitrogen material, superphosphate for phosphorus, and muriate of potash for potash. The superphosphate used is much more concentrated than in past years, the lower grades having entirely disappeared from the market, and the 20% superphosphate becoming dominant over the 16% grade which was the leading one in the 20's and 30's.

Total fertilizer consumption was over 9,000,000 tons in 1941, a high record. In this, there were 454,000 tons of nitrogen, 780,000 tons of phosphoric acid, and 460,000 tons of potash, high records for each. Many other interesting data by states and trends over a period of years are given in the Bulletin.

¶ Suggestions on the use of fertilizer grades permitted to be manufactured and sold in Georgia during the current season are given in Georgia Coastal Plain Experiment Station Mimeograph Paper No. 25 entitled "Fertilizers for South Georgia Field Crops in 1944." Two hundred to 400 pounds of 0-14-10 or 2-12-6 are suggested for peanuts, with the same rate of application of 2-12-6 recommended for corn, this to be supplemented on the latter crop with 100 to 150 pounds of a nitrogen top-dresser. On cotton, 3-9-6 at 500 to 600 pounds is suggested as the best analysis available. This should be supplemented with 150 pounds per acre of 10-0-10 as a top-dresser with an extra 50 to 100 pounds of muriate of potash needed on soils that are very deficient in potash, as indicated by severe rust in the past. Attention is called to the fact that the potash supply situation improved later in the season after the lower potash grades had been drawn up, and it is suggested that extra muriate of potash as a top-dressing can be used to supplement the lower potash grades that are being sold this year.

"Fertilizer Grades and Recommendations for Alabama July 1, 1943 to June 30, 1944," Agr. Exp. Sta., Auburn, Ala.

"Conservation and Use of Poultry Manure," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Press Bul. 590, July 1943, O. K. Moore, N. R. Mehrhof and R. V. Allison.

"Effect of Plow Sole Application of Fertilizer on Maturity, Yield and Fruiting Habits of Soybeans, 1943," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Mimeo. No. 40, R. R. Mulvey.

"What About Plowing Down Fertilizers?" Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Mimeo. No. 41, Dec. 1943, George D. Scarseth and George Enfield.

"Improving Victory Garden Fertility," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., E. Pamphlet 132, Jan. 1944, Paul M. Burson and C. O. Rost.

"The Boron Needs of New Jersey Soils," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 709, Jan. 1944, Eldrow Reeve, Arthur L. Prince, and Firman E. Bear.

"Poultry Manure," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 707, Sept. 1943, Wasley Yushok and Firman E. Bear.

"Fertilizers in the Farm Production Program," Agr. Exp. Sta., Wooster, Ohio, Agron. Mimeo. No. 91, Jan. 1944, R. E. Yoder.

"Inspection and Analysis of Commercial Fertilizers," Agr. Exp. Sta., Clemson, S. C., Bul. 348, Dec. 1943, H. J. Webb.

"Ammonium Nitrate as a Fertilizer," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. of Inf. No. 66, May 14, 1943, C. A. Mooers.

"Ammonium Nitrate," Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 342, Jan. 1944, Emil Truog, C. J. Chapman, and E. J. Graul.

"Fertilizer Demonstrations on Corn and Hemp," Soils Dept., Univ. of Wis., Madison, Wis., Oct. 1943, C. J. Chapman.

"1943 Results of Fertilizer Demonstrations on Small Grain, Hay, Corn, and Hemp," Soils Dept., Univ. of Wis., Madison, Wis., Sept. 1943, C. J. Chapman.

"Granular Ammonium Nitrate," U.S.D.A., Washington, D. C., AWI-81, Jan. 1944.

Crops

¶ Investigations on the effects of variety, rotation, and fertilization on yields and effects of Fusarium wilt and nematode injury on cotton are reported by P. A. Young in Texas Agricultural Experiment Station Bulletin 627, "Cottons Resistant to Wilt and Root Knot and the Effect of Potash Fertilizer in East Texas." Symptoms and methods of identifying Fusarium wilt, rust or pot-

ash hunger, and nematode injury or root knot are described. On the soils investigated, increasing the potash content of the fertilizers in most cases increased yield and reduced wilt injury. Increasing the phosphate content had a variable effect on yield and not much influence on wilt injury. Varieties differed considerably in their wilt resistance, and those most resistant to wilt usually did not respond as much to potash fertilization as other varieties more susceptible to wilt. Growing tomatoes in rotation with cotton appeared to reduce the wilt infestation. In the case of the Mebane and Half and Half varieties, each was susceptible to wilt and root knot, but the latter disease had little effect on the wilt resistance. Three of the Dixie varieties studied were resistant to wilt but tolerant to root knot, and the latter did not greatly decrease the wilt-resisting quality. Miller's 610 and Stonewilt are wilt-resistant varieties but susceptible to root knot, and the latter greatly decreased the wilt-resisting qualities of these varieties. Coker 4-in-1 and Rhyne's Cook varieties were resistant to both wilt and root knot and the latter appeared to have little effect on the wilt-resisting qualities of these varieties. Growing nematode-resistant crops such as crotalaria spectabilis, sorghum, and velvet beans greatly reduced nematode injury. Corn, Bermuda grass, oats, some varieties of cow peas, Porto Rico sweet potatoes, peanuts, and Laredo soybeans are nematode resistant and can be grown in the rotation so as to reduce nematode injury. In addition to growing these crops in the rotation, using 300 to 400 lbs. per acre of 6-8-8 or 4-10-7 fertilizer for cotton so as to prevent serious potash deficiency and properly adapted and resistant varieties are effective ways to overcome difficulties from wilt and nematodes. On land infested with both wilt and root knot organisms, Coker 4-in-1 variety is recommended. Rhyne's Cook is also suitable, but has a shorter staple. Where only wilt is bad, Miller 610 is recommended although a number of other varieties also can be used. Where neither wilt nor root knot is bad, Stoneville 2B and Deltapine 14 are recommended.

¶ A summary of two years' work with the use of borax on alfalfa in North Carolina has been issued by J. R. Piland, C. F. Ireland, and H. M. Reisenauer in North Carolina Agricultural Experiment Station, Agronomy Department Mimeo. Report entitled, "Boron Investigations on Alfalfa." The use of borax at varying rates increased the yield of alfalfa more or less in proportion to the application, up to 26 lbs. of borax per acre, on the average of 13 tests conducted over the two-year period. Individual test data, correlated with natural boron supply in the soil, are given. The results indicate that all of the soils needed a borax application for best results on alfalfa. Not only was the yield of hay increased, but the vigor of the stand was improved, indicating prolonged life of the stand. Competing plants were crowded out by the more vigorous alfalfa growth when borax was used. In one of the tests where seed yields were obtained they also were greatly benefited by borax, since practically no seed was produced when the treatment was omitted. Based on these two years' results, the authors conclude that each dollar invested in borax returned an average profit of $14.00 under prevailing price ranges for borax and hay. In the single test on seed production, the return was much higher. On a basis of this work, it is recommended that 25 to 35 lbs. of agricultural borax per acre be applied in the fall or winter on established stands or mixed with the fertilizer at seeding time when planting new seedings of alfalfa in North Carolina.

¶ So much is heard about the ability of leguminous plants to utilize atmospheric nitrogen by means of symbiotic bacterial organisms they can harbor in their roots, the fact that such a beneficial relationship is not limited to this combination is sometimes overlooked. There is a type of fungus known as mycorrhiza that can live symbiotically

on the roots of trees and other plants. Much less attention has been given to these than to the organisms in legume roots and there still are differences of opinion as to whether or not the mycorrhizae have the ability to utilize atmospheric nitrogen and even as to whether the organisms are purely parasitic, or whether there is a mutually beneficial relationship between the organisms and the plant in which they are growing. The frequency with which beneficial effects of the infestation appear to exist is good indication that, at least in some if not all cases, the mycorrhizae are beneficial. It was frequently thought that the beneficial effect might be due to the influence of the fungus on the solubility of soil nutrients rather than to any ability to utilize atmospheric nitrogen. Additional information on this is presented by A. L. McComb in Research Bulletin 314 of the Iowa Agricultural Experiment Station, entitled "Mycorrhizae and Phosphorus Nutrition in Pine Seedlings in a Prairie Soil Nursery." Results showed that the seedlings with mycorrhizae were about double in green and dry weight, had about double the phosphorus content on a percentage basis, and four times the total weight of phosphorus, as seedlings not infected with mycorrhizae. A lower percentage content of nitrogen was in the mycorrhizal seedlings, although because of the greater total weight of the plant the total weight of nitrogen was higher in these plants. The potassium content was slightly higher in the mycorrhizal plants, although probably not significantly so. The total potassium content on a weight basis in the mycorrhizal plants was more than twice that of the non-mycorrhizal plants. Studies on the root systems of the plant showed that the mycorrhizal seedlings had larger root systems and many more and larger absorbing root tips than the non-mycorrhizal seedlings. In a fertilizer experiment, the seedlings responded markedly to phosphorus fertilization, much more so than oats did on the same soil. It was observed also that mycorrhizae developed much more on soils better supplied with phosphorus. This work would indicate a very definite relationship between phosphorus nutrition and the mycorrhizae on roots of seedlings.

"Grape Varieties for Wine Production," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 356, Aug. 1943, M. A. Amerine and A. J. Winkler.

"The Blueberry," Dept. of Agr., Ottawa, Canada, Publ. 754, F. B. 120, Oct. 1943, E. L. Eaton, C. C. Eidt, A. D. Pickett, and J. F. Hockey.

"Report of the Minister of Agriculture, March 31, 1943," Ont. Dept. of Agr., Toronto, Ont.

"Report of the Addresses Delivered at the Annual Convention of the Ontario Crop Improvement Association," Ont. Dept. of Agr., Corps, Seeds and Weeds Branch, Toronto, Ont., Feb. 1943.

"Oats on Florida Farms Grow 50 Bushels to the Acre," Agr. Ext. Serv., Gainesville, Fla., Cir. 72, Sept. 1943, J. Lee Smith.

"Native Forage Plants of Cutover Forest Lands in the Coastal Plain of Georgia," Ga. Coastal Plain Exp. Sta., Univ. System of Ga., Tifton, Ga., Bul. 37, Aug. 1943, H. H. Biswell, W. O. Shepherd, B. L. Southwell, and T. S. Boggess, Jr.

"Tobacco Plant Production in the Coastal Plain of Georgia," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Bul. 38, Nov. 1943, J. M. Carr.

"1943 Indiana Corn Performance Tests," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Agron. Mimeo. 43, Jan. 1944, S. R. Miles.

"1943 Replicated Corn Test Results and a Guide to 1944 Planting," Ext. Div., Purdue Univ., West Lafayette, Ind., K. E. Beeson.

"1943 Report of the Muscatine Island Field Station," Ext. Serv., State of Iowa, Ames, Iowa, Victor E. Hollar.

"Increase Feed Production by Better Choice of Crops," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., E. Pamph. 133, Jan. 1944.

"Tests of Cotton Varieties in the Hill Section of Mississippi 1942," Agr. Exp. Sta., State College, Miss., Bul. 386, Feb. 1943, J. F. O'Kelly, E. B. Ferris, and T. E. Ashley.

"Annual Report of Mississippi Extension Service 1942," State College, Miss., E. Bul. 127, July 1943.

"Cultivation Studies of Certain Vegetables Grown on Peat Soils," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 795, June 1943, Robert D. Sweet.

"Sixty-Second Annual Report for the Year Ended June 30, 1943," Agr. Exp. Sta., N. Y. State, Geneva, N. Y.

"Report of the North Carolina Department of Agriculture," Raleigh, N. C., Nov. 1, 1942.

"Relation of Drouth and Grazing to North Dakota Range Lands," Agr. Exp. Sta., Fargo, N. Dak., Bul. 320, Feb. 1943, Warren Whitman, Herbert C. Hanson, and Roald Peterson.

"Chemical Composition of Oklahoma Grain Sorghums," Agr. Exp. Sta., Stillwater, Okla., Bul. No. B-274, Jan. 1944, V. G. Heller and John B. Seiglinger.

"Performance Tests of Corn Varieties and Hybrids, 1943," Agr. Exp. Sta., Stillwater, Okla., Bul. No. B-277, Jan. 1944, James S. Brooks and C. B. Cross.

"Water Requirement of Wheat at the Sherman Branch Experiment Station," Agr. Exp. Sta., Corvallis, Ore., T. Bul. 1, March 1943, David E. Stephens, Merrill M. Oveson, and George A. Mitchell.

"New Berries from Oregon's Plant Breeding Research," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 416, April 1943, George F. Waldo, Ernest H. Wiegand, and Henry Hartman.

"Science for the Farmer," Agr. Exp. Sta., State College, Pa., Bul. 446, July 1943.

"Wartime Farming in South Carolina," Clemson Agr. College, Clemson, S. C., A. R. 1942.

"Red Raspberry Culture," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. of Inf. 64, Feb. 12, 1943, Brooks D. Drain.

"Growing Garden Sage in Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. of Inf. 65, April 23, 1943, J. P. Overcash.

"Experiments on the Culture of Narcissus," Agr. Exp. Sta., Va. Poly. Inst., Blacksburg, Va., Bul. 357, Dec. 1943, A. G. Smith, Jr.

"Results of Hybrid Corn Yield Trials in West Virginia for 1943," Agr. Exp. Sta., Morgantown, W. Va., Mimeo. Cor. 49, Feb. 15, 1944, E. J. Wellhausen, J. L. Cartledge, and R. J. Friant.

"Report of the Secretary of Agriculture 1943," U.S.D.A., Washington, D. C.

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"Reseeding to Increase the Yield of Montana Range Lands," U.S.D.A., Washington, D. C., F.B. 1924, Feb. 1943, L. R. Short.

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"Growing High Quality Tomatoes," Ext. Serv., Texas A. & M. College, College Station, Tex., Food Production Series No. 13, J. F. Rosborough.

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"How to Increase Cottonseed Oil Production, U. S. D. A., Washington, D. C., AWI-46, June 1943, W. H. Tharp, Jr.

"Save Weather-Damaged Soybeans," U. S. D. A., Washington, D. C., AWI-71, Sept. 1943.

Soils

¶ The late Dr. Jacob G. Lipman initiated a comprehensive study of the plant-food resources of the United States. As part of this project an all inclusive compilation of analyses of soils was undertaken with the assistance of federal agencies such as Works Progress Administration and others. A portion of this work has recently been published by the New Jersey Agricultural Experiment Station under the title of "Analyses of United States Soils, Section 2: South Atlantic States" by J. S. Joffe and Adrienne B. Conybeare of that Station. The area covered stretches from Delaware and Maryland south to Florida, and includes all the Coastal states, West Virginia, and the District of Columbia. For the most part, analyses are for total content of the elements rather than in terms of any particular solubility. The completeness of the data is limited by the published data, since original analyses were not made for this publication. It is noted that more analyses were made for phosphorus than for any other element, followed closely by potassium, with somewhat fewer determinations for nitrogen and calcium, in the order named. Analyses for elements other than the four mentioned were much

fewer in number, and occurred in the following order of frequency: magnesium, iron, silicon, aluminum. The authors note that as one goes from the North to the South, the nitrogen, phosphorus, potash and calcium contents of the soil tend to decrease. The authors note also that the commonly held belief the heavier soils are higher in nutrient content than the lighter soils not only has many specific but even general exceptions. They conclude that the potassium content is more likely to be lower in the clays than in the loamy soils. The sandy soils also are lower in potassium. Thus the sandy loam and the clay and clay loams have about the same total quantity of potassium. The data are averaged in tables by states and by soil class, as well as given in detail by states.

"Soil Erosion and Land Use Survey Hope Township Project Area Durham County, Ontario," Ont. Agr. College, Guelph, Ont., Nov. 1943, N. R. Richards and F. F. Morwick.

"Soil Management Practices," Agr. Exp. Sta., State College, Miss., Bul. 381, June 1943, L. A. Davidson.

"Farm Terracing Costs," Agr. Exp. Sta., Stillwater, Okla., Bul. No. B-276, Jan. 1944, Peter Nelson and E. A. Tucker.

"Chemical Composition and Responses to Fertilization of Western Oregon Nut Orchard Soils as Indicated by Greenhouse and Field Trials," Agr. Exp. Sta., Corvallis, Ore., T. Bul. 3, July 1943, R. E. Stephenson and C. E. Schuster.

"This Land We Defend," State Soil Conserv. Com., Charleston, W. Va., First Biennial Report, Sept. 1939-Dec. 1942.

Economics

¶ An appraisal of the maximum agricultural production possible in Rhode Island and the factors that would influence the attainment of such production are given in Miscellaneous Publication 17 of the Rhode Island Agricultural Experiment Station entitled "Maximum Wartime Production Capacity of Rhode Island Agriculture" by J. L. Tennant and R. G. Wheeler in cooperation with other members of the staff of the Experiment Station. Prices for various agricultural products, labor supply, fertilizer supply, and available machinery all influence the production of the various agricultural products, favoring some and discouraging others. Under conditions of controlled prices, which to some extent are operative at present, those in charge of such control should keep a careful scrutiny over relative costs involved in growing or producing a commodity and adjust the price to be received for it, if production of the commodity is desired. The supply of labor is of great importance and the authors state that failure to control wages has made it difficult for farmers to obtain and retain trained qualified labor. Attention is called to the possibility of improving milk production by improving pasture and hay yields and quality. This will involve proper management and fertilization of pastures and meadows as well as selection of the best type of plants for seeding. There could be some increase in total acreage devoted to crops and some shifting of land from less intensive to more intensive cultivation. More machinery will be needed and larger amounts of lime and fertilizer, particularly analyses such as 4-10-10, 4-8-7, straight nitrogen fertilizers and superphosphate for use on potatoes, vegetables, fruits, corn, hay, and pasture land if maximum agricultural production is to be attained.

"Arizona Agriculture 1944," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 192, Jan. 1944, George W. Barr.

"Farm Labor Requirements in Mississippi," Agr. Exp. Sta., State College, Miss., Bul. 387, June 1943, Paul S. McComas and Frank J. Welch.

"Consumer Demand for Apples and Oranges," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 800, Aug. 1943, W. E. Black.

"A 1944 War Production Program for Tennessee Farms," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., E. Publ. 276.

"1944 Agricultural Conservation Program Bulletin," U.S.D.A., Washington, D. C., ACP-1944, Feb. 9, 1944.

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"Pears: Utilization of Production United States Total and Selected States," U.S.D.A., Washington, D. C., February 1944.

"Wanted: 14 Million Acres More Wheat for '44," U.S.D.A., Washington, D. C., AWI60, July 1943.

"The 10th Annual Report of the Farm Credit Administration 1942," U.S.D.A., Washington, D. C., April 2, 1943.

Applied Entomology

(A Book Review)

A FOURTH edition of their popular book on practical entomology has been prepared by H. T. Fernald and Harold H. Shepard, introducing the late developments in control and nomenclature in this important field. (Applied Entomology by H. T. Fernald and Harold H. Shepard. McGraw-Hill Book Company, Inc., New York, 1942, $3.50). The fact that the book has gone through four editions within the twenty-two years since it first appeared is evidence that it has found a place for itself in literature on entomology.

The book was written as a textbook and approaches the subject from the viewpoint of teaching it to students. The general course followed is conventional, but the material is presented in a clear, straightforward, and interesting manner with comments introduced from time to time in connection with habits of certain insects, manner of spread and control of insects, and other items useful in developing interest and a broader understanding of entomology.

The opening chapter shows where insects come in the whole realm of animals, and gives particular attention to differentiating insects from other closely related groups, with which they may be easily confused. The second chapter describes the general and typical form and parts of insects, useful in recognizing or identifying the various kinds. The next chapter gives the general internal structure of insects, with particular attention to relating this to methods used in their control. The fourth chapter takes up the typical life cycles of insects and tells how they grow, information necessary for the intelligent control of them. The total damage done by insects, ways in which they are beneficial to man, natural control as it does and does not work are covered in the fifth chapter. Chapter six surveys the general field of artificial control of insects under such headings as mechanical, cultural, biological, legislative, physical, and chemical control. The next three chapters take up chemical control in detail, with a separate chapter devoted to stomach poisons, contact insecticides, and fumigants. In these chapters, the chemicals are described, their desirable and undesirable characteristics mentioned, and their general use given. The tenth chapter briefly classifies the various groups of insects, following which there is a separate chapter for each order of insects, except that the three orders of Aptergota are included in one chapter; and the comparatively new and possibly questionable order, Zoraptera, is included in the chapter with Corrodentia. This takes up 23 chapters, with the arrangement in each rather uniform. Each chapter opens with a general description of the order, the distinguishing characteristics being given in italics, and the general importance of the order is briefly appraised. Each family in the order is then taken up, giving descriptions, common names, importance, and specific control measures—if called for. The final chapter is devoted to animals other than insects, such as spiders, mites, ticks, chiggers, sowbugs, earthworms, snails, and the like. They do not technically belong in a study of entomology but to the layman they are "bugs," and the entomologist is called on for information in their control.

The book is very complete, although the authors naturally give consideration primarily to insects found in North America. They state that in discussing control methods and materials, they have confined their remarks to those that have proven effective, but they have mentioned from time to time some of the more promising controls that have not yet been fully tested. In this

way, the book is up to date, but properly conservative.

It would appear as if with all the newer chemicals and other methods of control, we are just about holding our own in the continuous fight with insects. All serving in agricultural advisory capacities should stress the importance of intelligent insect control if full returns on investments in seed, fertilizers, labor, and land are to be realized. Applied Entomology can be recommended to advisers and to growers desiring information covering the entire field. While the book is presented by the authors primarily as a textbook, it certainly need not be confined to such usage. The practical approach, clear descriptions, numerous illustrations, completeness, and full index make the book excellent as a reference.

South Finds Clovers Excel in Profits

(*From page* 26)

ber. As soon as there is abundant moisture in the ground, 8 to 10 pounds of red clover seed are sown on the oats. The oats and clover will furnish an abundance of winter and spring grazing. The animals can be removed in April, a fine crop of hay cut about the first of June, and a seed crop harvested in late July or early August. If a maximum hay crop is desired, havesting should be delayed until a few dark heads appear. Where hay cutting is delayed, the clover will not yield as much seed as when it is cut earlier.

The most common method of harvesting the seed is by combining, using the windrow-pick-up method.

Soil Tests Indicate Potash Levels

(*From page* 23)

tions of these amounts as applied to expected field response. In making these interpretations the relationship between the level of potassium and that of other cations deserves consideration.

It is acknowledged that before any chemical test of a soil can be interpreted in the light of expected response to field treatment, it should be standardized or calibrated with actual field tests. Such a calibration or standardization may necessitate considerable research with various extractants and methods of determination. Certainly we have not completed the work along this line in North Carolina. But we feel that we have reached the point in our standardization with field tests where the farmer may benefit from the use of certain soil tests and from recommendations resulting from the proper interpretation of these tests.

Data presented in Table 1 and Figure 1 represent a grouping according to agricultural areas in North Carolina. The basis for division here is the rather distinct type of agriculture being practiced in each area. The division is, therefore, not based on soil differences, though to some extent the factors underlying the differentiation are tied up with differences in the make-up and character of the soils.

The figure and the data show that in all areas there is an appreciable spread in the content of "available" potassium. We might expect the areas in the eastern part of the State—in the Coastal Plain Section—to contain a larger percentage of soils that are in the low and

TABLE 1.—DISTRIBUTION BY AREAS—POTASSIUM EXTRACTED BY 0.05 N HCl

Area	Potash Level—Percent Distribution			
	High	Medium	Low	Very Low
1	16	22	37	25
2	17	29	42	13
3	17	36	42	5
4	18	26	35	21
5	20	26	40	14
6	20	24	41	15
7	21	21	42	16
8	35	30	28	7

very low categories. The figures do not substantiate this. In Area 1 are the greatest number of soils that are low or very low in potassium. But Areas 5, 6, and 7, which lie largely in the Piedmont, contain just as many soils in the lower categories as do Areas 2, 3, and 4. It must be admitted that Area 5 is a rather poor division as far as soil properties are concerned, for it includes some of the heavier soils of the Piedmont as well as the very light soils of the "sandhills" area. Area 8, which represents the mountain counties, contains a higher percentage of soils that are medium or high in potassium than do the other areas. While this might be expected, it is of interest to note that in this area there are soils where potassium content is low or very low. We see then the difficulty in generalizing in a recommendation for potash applications according to areas.

The occurrence of potassium deficiencies in many areas in North Carolina is very striking. Such deficiencies might be expected in the sandier soils, particularly when one considers a cropping system including peanuts and tobacco, which remove considerable quantities of potassium from the soil, and soybeans, tobacco, and cotton, which are quite susceptible to potassium deficiencies. In many fields symptoms are very evident and can be observed from the car driving along the highway. In other fields a closer examination of the crop or a tissue test is necessary to reveal the deficiency. In still others, no plant symptoms occur.

A general recommendation for potassium is, therefore, difficult to make. Tissue tests are of help in discovering deficiencies in time for side-dressing applications or for planning for next year's crop, but we have found soil tests to be of considerable help in spotting those areas that are unusually low in "available" potassium. Here potassium must be furnished in quantities greater than normal applications would provide. Other soils analyzed for "available" potassium are found to be better supplied. Our results indicate that in the fields represented by these soils, unusually large applications of potash are not practical. Still other soils will be found to contain relatively high quantities of potassium. On these

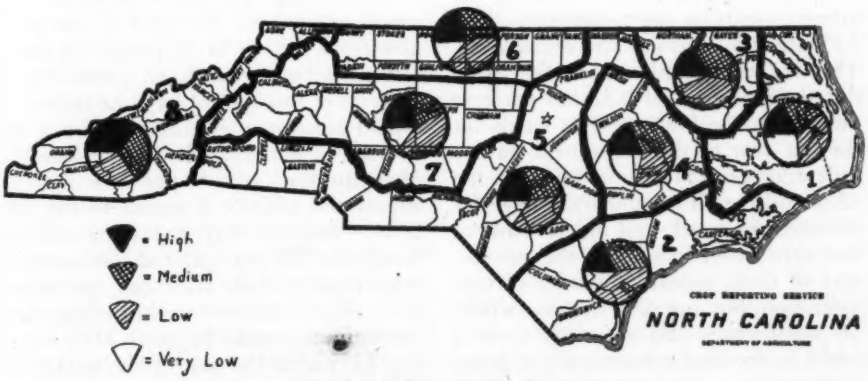

FIG. 1. LEVEL OF POTASSIUM IN NORTH CAROLINA SOILS BY AGRICULTURAL AREAS

areas, it is possible to reduce the potash application and, in the case of some crops or some rotations, to even omit potash for a few years.

In conclusion it should be emphasized that our work with soil tests for "available" potassium is still in the developmental stage. So is much of our work along agricultural lines, but this does not prevent our making the greatest practical use of what information we have on hand. We find in North Carolina that soil tests for "available" potassium can be of considerable help in determining the relative level of potassium in the soil and in arriving at practical fertilizer recommendations for a particular field.

That Land Boom

(*From page* 22)

they buy. Other suggested controls include buyers' permit and price ceilings. We are used to these terms now.

Other impacts must be considered before the all-round desirability of a measure can be determined, Mr. Regan reminds us. "Under controls, present owners of land might be able to realize less from the sale of their property, whereas those who paid higher prices in earlier years might not be able to recover their losses. Lenders who put their money into farm mortgages might think they were adversely affected. If a fairly large down payment should be generally required, tenants and young farmers might feel hard hit. Speculators certainly would object."

But many of the same individuals who would lose some of their immediate privileges and profits would probably benefit by controls, in the long run. When payments fail there are no profits, and property that comes back into unwilling hands may have deteriorated beyond the value of the payments made. Large groups on all sides of the question stand to gain from stability.

The Response of Various Crops to Potash Fertilization

(*From page* 20)

were applied as a neutral fertilizer, the average yields for four years were: 2.27, 2.35, and 2.59 tons per acre respectively. The highest potash application produced an average of 0.32 ton per acre more than the lowest. The yields for the last year of the experiment gave a difference of 0.55 ton in favor of the 32-pound potash treatment. These differences are small, and on the basis of one acre's contribution in the production of feed, appear unworthy of consideration, but any such increase would be worthwhile, and especially so if it could be obtained economically as it was in this case.

Considering the above average increase in soybean hay of 0.32 ton per acre from the use of 32 pounds of potash instead of 8 pounds, on a farm with 50 acres of this type of hay, the increase would amount to 16 tons. One ton of muriate of potash applied at the rate of 24 pounds of potash per acre would supply the additional potash to the 50 acres. Soybean hay has been selling locally for $35 per ton, and the average season price of all tame hay has been $25. The increased yield, using the latter figure, would be worth $410, leaving $359 after the cost of the potash is deducted.

Further experiments with soybean hay fertilized at the same rate, but using an acid fertilizer instead of a neutral fertilizer as above, showed yield gains for the potash treatments, but not quite so great as where the neutral fertilizer was used.

With oat hay where 0, 4, 8, and 16 pounds of potash were applied in the fertilizer, the yields averaged 0.23 ton more per acre with the highest rate than without potash over a four-year period when the fertilizer was neutral, and 0.31 ton when the fertilizer used was acid.

An experiment at the Edisto station with oats, following corn that had been fertilized with 100 pounds of potash per acre, gave no response in yield of grain to added potash.

Discussion

In South Carolina cotton and corn are the most extensively grown crops. Slightly more than 60 per cent of the fertilizer consumed within the State is used for these two crops. Approximately 2,700,000 acres were devoted to them in 1943.

Of the crops considered—cotton, corn, sweet potatoes, peaches, and tobacco—all have shown marked response to potash fertilization except corn. In many instances it was grown in a rotation. It can apparently utilize some of the potash that remains in the soil from that added for the preceding crop. However, the production of corn is more dependent upon moisture supply than upon the supply of available nutrients in the soil. That is why corn is usually grown on "bottom" lands in the Southeast. On many upland soils in the Piedmont one good crop of corn can be expected only about every four years. Regardless of the amount or kind of fertilizer used, the yields are automatically limited. For this reason this type of land often receives no fertilizer for corn, and seldom more than 200 to 300 pounds per acre. In an average season more fertilizer would not be profitable.

Of the 1,545,000 acres of corn planted in South Carolina in 1943, a relatively high proportion is suitable for other grain crops, including the grain sorghums. By devoting more land to certain of these crops, and less to corn, especially on the sites least suited for it, more pounds of dry matter for feed could be produced per acre than is the case under the present system.

Each year more acres are being devoted to the important food crop, sweet potatoes. Considerable experimental work has been done with this crop. Promising varieties are now in wide use. For best production it appears as though there is still much to be learned. Like peanuts, sweet potatoes are heavy feeders on potash. However, probably due to their feeding habits both of these crops are often able to succeed on certain soils very low in available potash, and it is only after they have been grown on the same site several times that definite response to potash fertilization may result.

The commonly grown truck crops and most of the hay crops remove relatively large amounts of potash from the soil. The soils on which truck crops are produced along the Coast have received heavy applications of complete fertilizers for many years. On such soils several years of experimentation may be required to deplete the available potash to the level that the no-potash treatments begin to decline in production to an appreciable extent. In commercial trucking areas ample fertilizer is always applied because the immediate per-acre value of the crop is high. Hay crops on the other hand have received less attention from the standpoint of fertilization because the apparent per-acre value of the crop is relatively low.

The small grains, wheat, oats, barley, and rye have, in general, played a more or less minor role in the agriculture of the Southeast. For this reason few fertilizer experiments have been devoted to them. On the average more pounds of dry matter for feed can be produced per acre in South Carolina by oats and barley than by corn. Now that desirable varieties which withstand the average winter are available, it might be well if more emphasis could be placed

upon fertilizing these crops for higher yields.

Summary

For cotton, corn, sweet potatoes, peaches, and tobacco, experimental data from representative potash fertilization experiments in South Carolina are presented. The observed response to potash application is converted into its calculated equivalent in terms of monetary value. With the exception of peaches, these calculations are based on the average season price received by farmers. In 1943 the price of peaches was abnormally high in relation to that of other crops. For this reason a more representative figure was used in estimating the value of the increased production of this crop due to the addition of potash to the fertilizer.

It is, of course, realized the reported returns for cotton, corn, and sweet potatoes, based on the current average price received by farmers, exceed those for pre-war conditions. However, present conditions demand critical attention to all phases of agricultural production. Calculating response to potash fertilization in terms of 1943-1944 season prices may serve to emphasize the importance of fully utilizing existing supplies of potash. The same might be said for nitrogen and phosphoric acid.

Doubling Production By Bettering Soils

(*From page* 10)

all the individual field trials have been recorded in complete reports and these reports have been placed in the hands of our educational leaders, the fertilizer salesmen, and dealers. Many of the agronomists of the Soil Conservation Service, as well as county and community committeemen of the AAA, have cooperated in this work.

These demonstrations were carried out in a program designed to call attention to the importance of using fertilizer at the time of seeding down to clover or alfalfa. The size of the average plot varied from one-half to one acre. A large number of fertilizer combination grain drills were loaned by the implement manufacturers and used by county agents in the installation of their plots. These drills were hauled by truck, trailer, or on rubber tires from farm to farm in the various counties, and frequently as many as 20 to 30 demonstrations were installed by a county agent each year. The fertilizers needed for this extensive program were supplied by the Middle West Soil Improvement Committee and the American Potash Institute.

In addition to the type of demonstration just described, we have set up a large number of so-called "whole-farm demonstrations" in cooperation with the Tennessee Valley Authority. We are now operating in 27 counties in Wisconsin under this program. In the unit-farm demonstrational work, the plan has been to set up a fertility-and crop-management program for the entire farm and carry it out over a period of five years. The phosphate is supplied by the T.V.A. (Farmer cooperators pay the freight.) However, the individual farmer cooperator is required to purchase lime and potash as needed, and he agrees further to follow out cropping practices as recommended by the supervisor of the project. Rather liberal applications of fertilizers are made at the time of seeding down to small grain and legumes. A total of nearly 500 farmers are now cooperating in these whole-farm demonstration projects in Wisconsin. In those counties where the work was first started (now in its 5th year), we have many outstanding examples of what can be accomplished through a program of fertilization and crop management. On most of the farms crop production has been greatly increased, the quality of the feed grown has been improved, and

livestock-carrying capacity is now being reflected in larger herds of better fed cows.

The sum total of all efforts in this great educational program has had its effect. The prejudice against fertilizer is disappearing. With everyone talking and telling the same story, an idea soon becomes a part of mass thinking. That is what has happened. There are now a good 5,000 active leaders telling this story of soil improvement and soil conservation in Wisconsin. And again, I give credit to the Federal Agencies, S.C.S., T.V.A., A.A.A., F.S.A., for their contribution in carrying this program of soil fertility maintenance and conservation to our farmers. Smith Hughes teachers of vocational agriculture cooperating with county agents and our state soil specialists have contributed much in this great educational program.

And what do the results of all these fertilizer demonstrations show? It is a story in actual figures which prove without doubt that fertilizers are needed and can be used with profit on a high percentage of the farms in Wisconsin. When we average up all the data, good and bad, we find that there was a sufficient increase in the yield of grain alone to more than pay for the fertilizer in 85 per cent of all the trials. We find in comparisons made between 20 per cent superphosphate and phosphate-potash mixtures that in 55 per cent of all these trials, the P-K mixtures gave the largest profit. The average of all these grain plots, where direct comparisons were made between 0-20-0 and 0-20-10, are given in Table 1.

When the residual effect of fertilizers applied at the time of seeding was checked on hay yields the year following and the value of the increases in yield of hay was added to the value of increases in grain and straw, we find that a profit has been shown in 95 per cent of all the trials. We find further that where comparisons of superphosphate and phosphate-potash mixtures were made, the largest net profit was shown in 70 per cent of the trials where both phosphate and potash were used. Table 2 gives a complete summary showing dollar per-acre values of hay, grain, and straw plus residual carry-over benefit to the hay crop.

The results of these demonstrations carried out over a period of years give us conclusive evidence that potash is needed on quite a high percentage of the soils in Wisconsin, especially where legumes are being seeded with the grain. On the silt and clay loam soils of average fertility we are now recommending from 300 to 400 pounds of 0-20-10 or 0-14-7 per acre. On the sandier soils, where seedings of alfalfa and clover are being made, we recommend up to 400 or even 500 pounds of 0-20-20 or 0-14-14 per acre.

We did find some fields where phosphate only was needed and occasional fields which were well supplied with all plant-food elements and where no fer-

TABLE 1.—AVERAGE OF 507 GRAIN DEMONSTRATIONS (11 YEARS, INCLUDING 1943) WHERE A COMPARISON OF 0–20–0 AND 0–20–10 WAS MADE

Treatment	Average rate per acre lbs.	Average yield bu.	Increase yield bu.	Average yield straw lbs.	Increase straw lbs.	Value of increase grain + straw	Cost of fertilizer	Net profit per acre*
0–20–0	200	52.6	10.3	2,562	447	$6.85	$2.55	$4.30
0–20–10	200	56.7	14.4	2,727	612	9.58	3.65	5.93
Check		42.3		2,115				

* Oats and barley figured at average value of 60c per bushel; straw, at $3 per ton.

TABLE 2.—RESIDUAL CARRY-OVER BENEFIT TO HAY CROP (11 YEARS, INCLUDING 1943) SHOWING TOTAL VALUE OF HAY, GRAIN, AND STRAW, AND PROFIT OVER COST OF FERTILIZER (119 PLOTS)

Treatment	Rate per acre lbs.	Average yield grain bu.	Value of increase grain + straw	Average yield of hay lbs.	Increase hay lbs.	Value of increase grain, straw and hay	Cost of fertilizer	Net profit per acre
0–20–0.....	200	51.7	$7.27	4,477	1,048	$12.51	$2.55	$9.96*
0–20–10.....	200	55.3	9.68	5,078	1,649	17.93	3.65	14.28
Check.....	.....	40.7	.....	3,429	.....	.....	.....	.....

* Oats and barley figured at average value of 60c per bushel; straw, at $3 per ton. Hay figured at $10 per ton.

tilizers were needed. We urge farmers to have their soils tested, as a means of determining the fertilizer requirements of their soils.

It is my belief that the application of from 300 to 500 pounds of commercial fertilizer per acre every time we seed our fields down to clover and alfalfa will gradually build up the fertility of the farm as a whole. Large yields of grain and bigger crops of alfalfa and clover will add to the home-grown feed supply and will thus cut feed costs and increase the possible livestock-carrying capacity of the farm. We urge our farmers to take care of their stable manure and get the plant food contained in it back to their cultivated fields.

With prices for farm produce at present high levels, not only has manure a much higher value than is in ordinary times, but we will find it profitable to use commercial fertilizers at heavier rates. Let's also carry out all those other practices of good soil, crop, and livestock management for greater profit now and in the years that lie ahead.

Co-op Warp and Woof

(*From page* 5)

form of cooperative effort, with farmers in the front rank and labor next. I have been at the borning of dairy ventures of this kind, have seen credit systems set up on this principle, and been through the whole gamut of topics included in business transactions. Only a short time ago I "wrote up" the final goal of rural cooperative ardor—a funeral parlor and embalmer under contract to a cooperative society and coffins twenty dollars less than the same kind sold by frock-coated "mortuaries." Just previously my trail led to a cooperative hospital with lying-in privileges, if you had enough advance notice to join. Thus in my bailiwick the pathway of mutual sharing leads, like religion, from the cradle to the grave.

What place will organized cooperatives take in the new "world order" which it is assumed will emerge after the guns are silent? No question it seems to me presents a bigger challenge to those absorbed in building and maintaining true cooperative relations in agriculture.

Last month a prominent and successful capitalist of my town came to me with fretful and disturbing ideas, asking everyone with any remote opinions

on it what the future might bring in the way of evolution in business conduct.

"Are we facing a cooperative state, a communistic commonwealth, a dose of Fascism, or a socialistic era?" was his dilemma. Naturally he thought first of the farmer cooperatives, or maybe a blend of both producer and consumer co-ops to take over the reins and hold a club over the heads of cringing capital.

FROM my long association with old-line cooperative leaders in this country, I have evolved a theory about this which may or may not begin to answer this man's fears and forebodings. Let me state, however, that I cannot vouch for the huge machinery of consumer co-operatives, both here and abroad, for the reason that they are bound by different rules and ideals than farmer groups seem to be, and they are in the majority when it comes to mass voting power. What I set down now relates solely to the farmer co-ops, but if they run true to form we don't need to vision any drastic changes over night.

Just two points in my estimation fix the attitude of agricultural co-ops toward the problem my capitalistic friend presents. See if you agree with me.

First, organized farmers and individuals making up the membership control of big and little co-ops of all kinds are deadly enemies of two things directly related to the radical movements he outlines, that is, farm thinkers oppose depriving individuals and business groups of full control of private property. No greater stronghold of private capitalism exists than among the rural class on the whole. Further, farm leaders are overwhelmingly against any movement which is dominated and motivated by political machines.

THERE we have it—rural hatred of any move to abolish property rights or inject partisan or carpetbagger control of business procedure. If you take these two points plus the natural antagonism of our farmers toward bureaucratic governmental redtape and inefficiency, believe me, you've got a bulwark of defense against encroachments and shifts of the kind feared by my inquiring friend.

Communism means the ownership and control of both producer and consumer goods by the all-powerful state. Socialism would bring in producer control at least, plus politics. Fascism stands for letting private rights in production and distribution alone as such, but would demand dictatorial dominations of the whole network by the government. In none of these waves of revolt would there be much support gained from farmers and their cooperatives.

However it strikes me that if you separate these three movements and study them over to see which presents the most likelihood of securing some organized farm support, it might be Fascism. Here the bait of letting private property alone is an advantage over the other two proposals. Fascism would not get started among farmers, but it might easily find a beginning elsewhere in capitalism, and gradually take hold by means of shrewd political maneuvers. It wouldn't be called Fascism, of course—that name is so costly to us in blood and treasure—but a snappy promotion scheme under a different brand could be foisted on us in the confusion of a postwar crisis.

I see less chance for Communism because that would get its start in consuming masses, rather than in production centers, and you don't get funds for high-power political campaigns out of consumers' units, at least the kind we have today.

BUT if we are going to rely upon the native sanity and soundness of agricultural groups to oppose half-baked or even dangerous schemes cloaked in politics, we've got to overhaul and pep up the leadership and followship of our everyday rural cooperative organizations.

Since the war there has been a tendency to let some of those intrepid groups languish and decay. The membership has been so disturbed and frustrated by the war and loss of relatives, with all old traditions torn aside, that we have seen a general weakening of reliance upon and loyalty to the original cooperatives.

Likewise a sort of intolerant spirit has crept into the directorate of many co-ops, a grave tendency to depend on lobbying and jockeying, state and federal support and financial aid, a new class-consciousness, and a wave of anti-labor feeling.

We have seen co-op leaders wax oratorical over some secondary topic with a political slant and neglect real defense of their organizations against attacks from agencies with whom they have been connected in business, or those in the same line of business.

As I see it, the future ahead of cooperatives is bound to demand the best of balanced talent and stability in their directorate. Competition is something no co-op ever found a way to overcome, and probably that's a good thing—both for themselves and their patrons. Even if private business rivals were all abolished, the cooperative would still be obliged to compete with another service or supply co-op, unless we turn it all over to state control and embrace Fascism. In meeting postwar competition only leaders of daring and imagination will win out.

Finally, the basic faith of pioneer cooperative organizers was that "cooperation is different because it is a way of life." This was based on the good old days when folks helped each other so manfully in creating vast new empires in virgin lands.

Yet if you pause long enough to think into this aspect of history, you'll admit that in reality the pioneer farmers were noted instead for rugged independence and brave self-reliance from dawn to dark. Only in cases where they could not do it all themselves did they join hands with neighbors. Mostly these were extra heavy lifting jobs, or sentimental assistance in case of illness, death, or children lost in the woods.

Our modern cooperatives are fitted to a society where no farmer could possibly be entirely self-sufficing and independent at any stage. In fact these days the farmer goes to town for most of his necessities aside from raw food. He belongs to a cooperative society, even if he shares that situation with private factories and stores. We're all more or less interdependent and we'd be sunk without the goods and services of our fellow citizens. The wilderness has gone forever. We are tied together for good. Not just farmers tied together by some mystic bond reaching back to a bygone "way of life" that has ceased to function; it includes all of us of all occupations everywhere. It isn't just a "way of life" for rural inhabitants; it's a universal dependence on cooperation for everybody.

POSSIBLY the quicker we all realize that and let it sink in, the better off we'll be to solve the tremendous problems which will perplex us all, regardless of creed or profession. Thus cooperation is indeed a way of life, a practical goal as well as a religion. What will our leaders do about it?

A customer at a roadhouse stand asked for coffee and doughnuts. He protested because his coffee was served without a saucer.

The waitress explained: "We don't hand out saucers no more. A hill-billy drifted in yesterday and drunk out o' his saucer, an' that ain't good fer trade. This here is a swell dump."

The diner was reading the latest sensation in the morning paper and looked up to talk to the waitress.

"How would you like to be buried in a snowdrift for eighteen hours with your sweetie?" he asked.

"Say if me and my sweetie was buried in a snowdrift we'd be swimming in twenty minutes."

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

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Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Fertilizing Small Fruits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
Fertilize Pastures for Better Livestock (Pacific Coast)
Of Course I'm Interested (Pastures, Canada)
Meet the Family (Canada)

Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
N-9 Problems of Feeding Cigarleaf Tobacco
T-9 Fertilizing Potatoes in New England
MM-9 Fertilizing Tomatoes in Virginia
UU-9 Oregon Beets and Celery Need Boron
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
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E-2-42 Fertilizing for More and Better Vegetables
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G-3-42 More Legumes for Ontario Mean More Cheese for Britain
H-3-42 Legumes Are Essential to Sound Agriculture
I-3-42 High-grade Fertilizers Are More Profitable
P-5-42 Purpose and Function of Soil Tests
Q-5-42 Potash Extends the Life of Clover Stands
S-6-42 A Comparison of Boron Deficiency Symptoms and Potash Leafhopper Injury on Alfalfa
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SNAPPY STORY

"George broke up my party the other evening. He started to tell a story and I had to send him home."

"Well?"

"But all the rest followed him home to hear the end of it."

Visitor: "To what do you attribute your great age and good health?"

Oldest Inhabitant: "Well, in the first place I got a good start on most people by being born afore these here germs wuz invented."

The aviation cadet was walking with his girl friend. A plane passed high overhead. "Oh, what a pretty airplane," commented the girl friend. "What kind is it?"

The young air student looked again. "Why, that's a mail plane," he said.

The girl's eyes opened wide. "How can you tell from here?"

Kitty has a little swing,
It isn't hard to find;
For everywhere that Kitty goes
The swing is just behind.

The mountaineer walked into the doctor's office and told the doctor that he wanted him to see what he could do about patching up his son-in-law's ear—saying, "I shot a hole in it yesterday."

The doctor reprimanded him severely—the idea of shooting his son-in-law.

The mountaineer replied, "Waal you see he wasn't my son-in-law yesterday."

Some men criticize the girls who wear revealing garments—but ignore those who don't.

WE LIKE THESE CALM GALS

The demure young bride, her face reflecting winsome innocence, slowly walked down the church aisle, clinging to the arm of her father. As she reached the platform before the altar, her dainty foot brushed a potted flower, upsetting it. She looked at the spilled dirt gravely, then raised her large child-like eyes to the sedate face of the old minister. "That's a hell of a place to put a lily," she said.

"Who was that man that was kissing you in front of the Rialto building today?"

"I just couldn't place him, but he seemed to know me pretty well."

OBVIOUSLY

One of those super-intelligent seniors entered the professor's office one morning and in a very superior tone remarked:

"Last night, professor, your daughter accepted my proposal of marriage. Fully realizing the importance of the step, I have called to see you and to inquire if there is any insanity in your family."

The old professor looked up over his glasses and surveyed the young man in silence for a moment, then sadly nodding his head, remarked: "Yes, yes. There must be."

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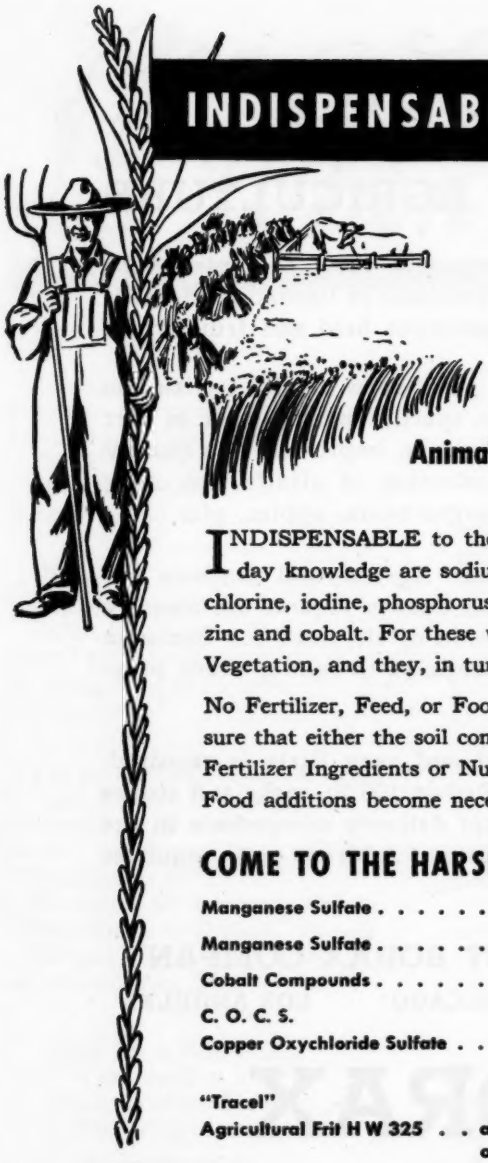

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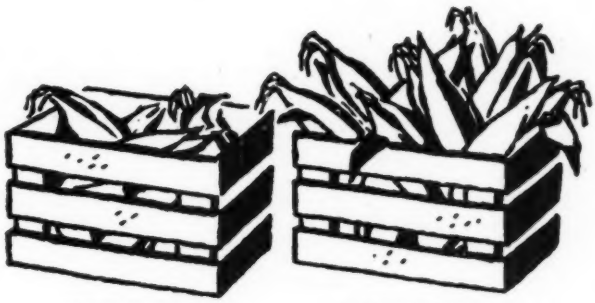

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